RAILROAD GAZETTE

FRIDAY, APRIL 8.

NEWS OF THE WEEK.

We give below, in a condensed form, the leading news items of the week. These items will be found in detail in their appropriate columns.

Meetings Next Week.—Long Island, at Long Island City, N. Y.

Elections.—Anniston & Cincinnati, A. L. Tyler, President.—Baltimore & Ohio, W. M. Clements, Manager of lines east of Ohio River; W. W. Peabody, Manager of lines west.—Birmingham, La Grange & Macon, John T. Milner, President.—Chicago & Eastern Illinois, Richard M. Hoe, President; Horace H. Stevens, Vice-President.—Cincinnati, Huntsville & Birmingham, William Richardson, President.—Columbus & Cincinnati Midland, Orland Smith, President.—Columbus & Western, F. Y. Dabney, Chief Engineer.—Eufaula & St. Andrews Bay, W. N. Reeves, President.—Iowa Railroad Commission, G. S. Robinson, Commissioner.—Kansas Railroad Commission, A. R. Green, Commissioner.—Lookout Mountain, C. E. James, President.—Louisiana, Moberly & Omaha, G. F. Rothwell, President.—New York, Woodhaven & Rockaway, Austin Corbin, President.—New York, New Haven & Hartford, Henry A. Bishop, Purchasing Agent.—North & South Alabama, R. S. Minor, Superintendent.—Oregon, Southern Pacific Coast & Utah, Asher Marks, President.—Tacoma Railway, Dock & Navigation Co., Philip Metzler, President.—Wabash, St. Louis & Pacific, John T. McNulta, Receiver.—Galveston, Houston & Texas, Jay Gould, President.

New Companies Organized.—Alexandria & Texas incorporated in Louisiana.—Cincinnati, Huntsville & Birmingham files articles in Alabama.—Dallas Consolidated organized in Texas.—Kansas & Colorado files charter in Kansas.—Lincoln & Black Hills files articles in Nebraska.—Lincoln Rapid Transit files articles in Nebraska.—Lookout Mountain organized in Tennessee.—Louisiana, Moberly & Omaha organized in Missouri.—New York, Wheeling, St. Louis & Chicago incorporated in Illinois.—Oregon, Southern Pacific Coast & Utah incorporated in Oregon.—Pacific files charter in Kansas.—Richland obtains charter in Tennessee.—Santa Rosa & Carquinez files articles in California.—Santa Rosa, Sebastopol & Green Valley files articles in California.—Tacoma Railway, Dock & Navigation Co. files articles in Washington Ter.—United States Railway Improvement Co. obtains charter in Illinois.

Changes and Extensions.—*Alabama:* Mobile & Birmingham is nearly completed from Mobile to Jackson.—*Arizona:* Maricopa & Phœnix is completed from Maricopa to the Gila River.—*California:* Nevada & California will extend road 57 miles from Moran to Hot Springs.—San Pablo & Tulare is built from Tracy, 17 miles.—*Dakota:* St. Paul, Minneapolis & Manitoba will complete Rugby and Bottineau branch.—*Florida:* Florida Southern will build from Palatka to Ocala.—*Georgia:* Savannah, Dublin & Western Short Line is to be built through to Macon.—*Indian Territory:* Southern Kansas is completed to the Indian River.—Gulf, Colorado & Santa Fe is completed to Dorothy Station.—*Iowa:* Illinois Central will build line parallel to the Dubuque & Sioux City.—*Maryland:* Tivoli road is now being surveyed.—*Massachusetts:* The Concord and the Haverhill at Lawrence will build extension.—*Minnesota:* Duluth, Red Wing & Southern will soon locate the new line.—*Mississippi:* Georgia Pacific extends line from Columbus to Starkville.—*Ohio:* Dayton & Ironton is changed to standard gauge.—*Tennessee:* Rome & Carrollton is to begin construction of 40 miles of new road.—*Texas:* Fort Worth & Rio Grande's track laid for 18 miles.—*Virginia and Kentucky:* Louisville & Nashville and Norfolk & Western are to build to a connection in Virginia.

Leases and Sales.—Addison & Northern Pennsylvania will be sold on May 5.—Chicago & Eastern Illinois is controlled by a new syndicate.—Minnesota & Northwestern purchased the Dubuque & Dakota.—Missouri Pacific takes possession of the Little Rock & Fort Smith, and will begin several extensions.—Southern Pacific secures the Portland & Willamette.—Wabash Western is now possessed by the Wabash Purchasing Committee.

Traffic.—Anthracite coal shipments for week ending April 2 show increase of 6.0 per cent. over corresponding period last year; bituminous shows increase of 67.9 per cent.; coke, for week ending March 26, shows increase of 24.2 per cent.—Cotton receipts, interior markets, for the week ending April 1, show increase of 16.5 per cent. over corresponding period last year; shipments show increase of 28.3 per cent.; seaport receipts show decrease of 42.2 per cent.; exports a decrease of 0.2 per cent.; cotton in sight is less than at same date last year by 42.3 per cent.

Earnings.—Thirty-one roads report gross earnings for March, 30 showing an increase for the month and one a decrease.

Reports and Financial.—Union Pacific system for the year ending Dec. 31 shows an increase of 3.6 per cent. gross and a decrease of 7.1 per cent. net.

Miscellaneous.—Central of Georgia makes several important changes in its system.—Charleston, Cincinnati & Chicago obtains permission to build its road.—Chicago, Santa Fe & California will enter Chicago on the Chicago & Western Indiana.—Chicago, Santa Fe & California files mortgage for $1,500,000.—Louisville, St. Louis & Texas files a first mortgage of $2,800,000.—Wabash, St. Louis & Pacific has adverse judgment rendered for $20,654,523.

Contributions.

"Reversed Blue-Prints."

Chicago, Milwaukee & St. Paul Railway.
CHIEF ENGINEER'S OFFICE,
MILWAUKEE, March 30, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Can you inform me of the compositions used in taking prints from tracings by the gallic acid or black on white process? We should like to adopt this mode of printing if the names of ingredients can be had. F. G. BOLLES.

[The names of the ingredients used in preparing paper for what is quite commonly known as the "reversed blue-print process" cannot easily be had, as they are preserved a trade secret by the manufacturers. It should not, however, prevent the use of the process, as the prepared paper is furnished at very nearly the cost of drawing paper by the agents, Messrs. C. F. Ketcham & Co., of New York, and also, probably, by other dealers.—EDITOR OF THE RAILROAD GAZETTE.]

Bridge Tests.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I make a suggestion in regard to testing bridges to secure the safety of the public without interfering with improvements in bridge building. Before using any bridge on a railroad it has to be submitted to the following test: A train weighing 40 per cent. more per lineal foot than the legal load is to be run over the bridge at a velocity 30 per cent. greater than the legal velocity. Any bridge which shows a permanent deformation under the test load is to be condemned. The running of a heavier train than the legal one or with a greater velocity than the legal velocity, is to be made a crime. Each railroad can choose its legal load and legal velocity as it pleases.

This test would not hurt any safe bridges, and would prove that the bridges which stand it are safe against breaking on account of the legal loads with the legal velocities. The only serious objection appears to me that it is no test of the lateral system. This might be easily tested by unrolling a canvass curtain stretching all along the bridge in a storm, so as to give a wind pressure of 45 pounds per square foot of bridge and train, and to let the test train pass at the same time. The test for vertical loads is certainly easy of impartial application, would guarantee the safety of the bridges under vertical loads, and would not interfere with improvements in bridge building. The test of the lateral system is perhaps more objectionable on account of expense, but it would certainly prove the safety of the bridge against any storm. Any other process of ascertaining the strength of a bridge than the submitting the bridge to forces very similar and somewhat larger than those to which it is actually submitted under ordinary circumstances is complicated, and, on account of many unknown factors, unsatisfactory and difficult of impartial application. The only points which are controversial seem to me the percentages of excess of test load above legal load. BRIDGE DESIGNER.

Time Table Rules.

BOSTON, April 7, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

You mention in your editorial of March 25 the desirableness of settled and uniform views on the clearance necessary for trains at meeting places and criticise the distinguished gentlemen who made this uniform code for not making a three-minute or a five-minute clearance rule that would be agreed to by the roads. Now, although I do not blame the committee, I think your point is well taken, and that the customary clearance of 5 or 10 minutes should be continued. The committee have, to be sure, left the matter open, and I am perfectly free to adopt whatever clearance I see fit, but at the same time the preference of the committee is plainly for the rule as formulated in their code; that is, they say very plainly that as for them they will have all the watches kept in tip-top condition and run passenger trains so that neither train will have to waste a bit of time at meeting places; and a road that insists on being old-fogyish enough to stick to the present way will stand a chance of incurring odium. We shall be considered by the public as "slow" and not up to snuff; if we have an accident, no matter how remote the cause, it will be attributed to a general lack of enterprise, and lawyers defending claimants who want $10,000 for a little toe will contemptuously compare us with some "enterprising" company that follows the lead of the committee. The notions revolving in my mind that impel me to write this may be trifles, very likely they are; but lawyers use these very trifles to construct mountains of when prosecuting a case against a railroad.

Now, what are we going to do? How many roads are going to fall in with the committee's views? If we conservatives are going to be left in a hopeless minority we may possibly join the crowd against our will, but it really seems as though somebody ought to voice the sentiment of the men who fear the committee are going too fast. We are really desirous of agreeing with the committee, and the roads they belong on being of very high reputation, we look for convincing arguments for all their opinions. If our roads are in a position where they ought to have a general jacking up to put them on a level with those which can manage train running on the plan of running so "close to the wind" we want to know it.

Why shouldn't the train *having the right to the road* wait 2, 3, 5 or 10 minutes in case the other one has not reached the meeting station? Then, in case both trains were on time no delay would be incurred, and the five minutes would be wasted only in the infrequent cases where one or the other became late. As the committee have left it, any superintendent who believes that "grades or other conditions are such that greater protection is necessary," and wishes to allow, say five minutes at meeting points, must *waste that number of minutes* every day at every meeting. Must a road, just because its manager is cautious, invite the public to notice the difference between "standard" roads and its own by having half its trains always stop 5 minutes at every meeting point? Where is uniformity coming in if these noticeable discrepancies are to remain? N. E. S.

[The *Railroad Gazette* criticised the convention rather than the committee, if it criticised either; but, however fault-finding the tone may have been, it should not be regarded as criticism, for the discussion concerns chiefly *future* action, which, of course cannot be criticised.

"N. E. S." undoubtedly represents a large class—those who think more about the things that are not uniform than about those which are. The committee "took advanced ground" as they say, and it is greatly to be desired that other operating officers consider the matter very carefully before they decide *not* to follow the committee in the high standard that has been set. The committee says virtually that many roads which now allow five or ten minutes leeway could with advantage reduce this interval to one minute or less—in fact make it *nil*. It will be a pity if superintendents reject this decision without good reason, and, if there are good reasons, the convention would seem to be the place to bring them out. The committee is composed of some of the most intelligent and capable men of their profession, and they have given the matter unstinted time and thought. They have left loop-holes for the ultra-conservatives to continue in their old way, but that they expected many entire roads to be still operated on the plan which they have virtually rejected seems at least improbable. The simple argument for a long leeway is to provide for miscalculations; the simple argument on the other side is that however much time is allowed the trainmen will encroach on it. It is said that where superior trains have absolute right, still the runners frequently or generally have an unwritten law under which they take care to leave meeting points two or three minutes late—in other words, although they have the right to wholly disregard the inferior train they do not avail themselves of that right in such cases. The systematic way would seem to be to at once change this law from the unwritten to the written category.—EDITOR RAILROAD GAZETTE.]

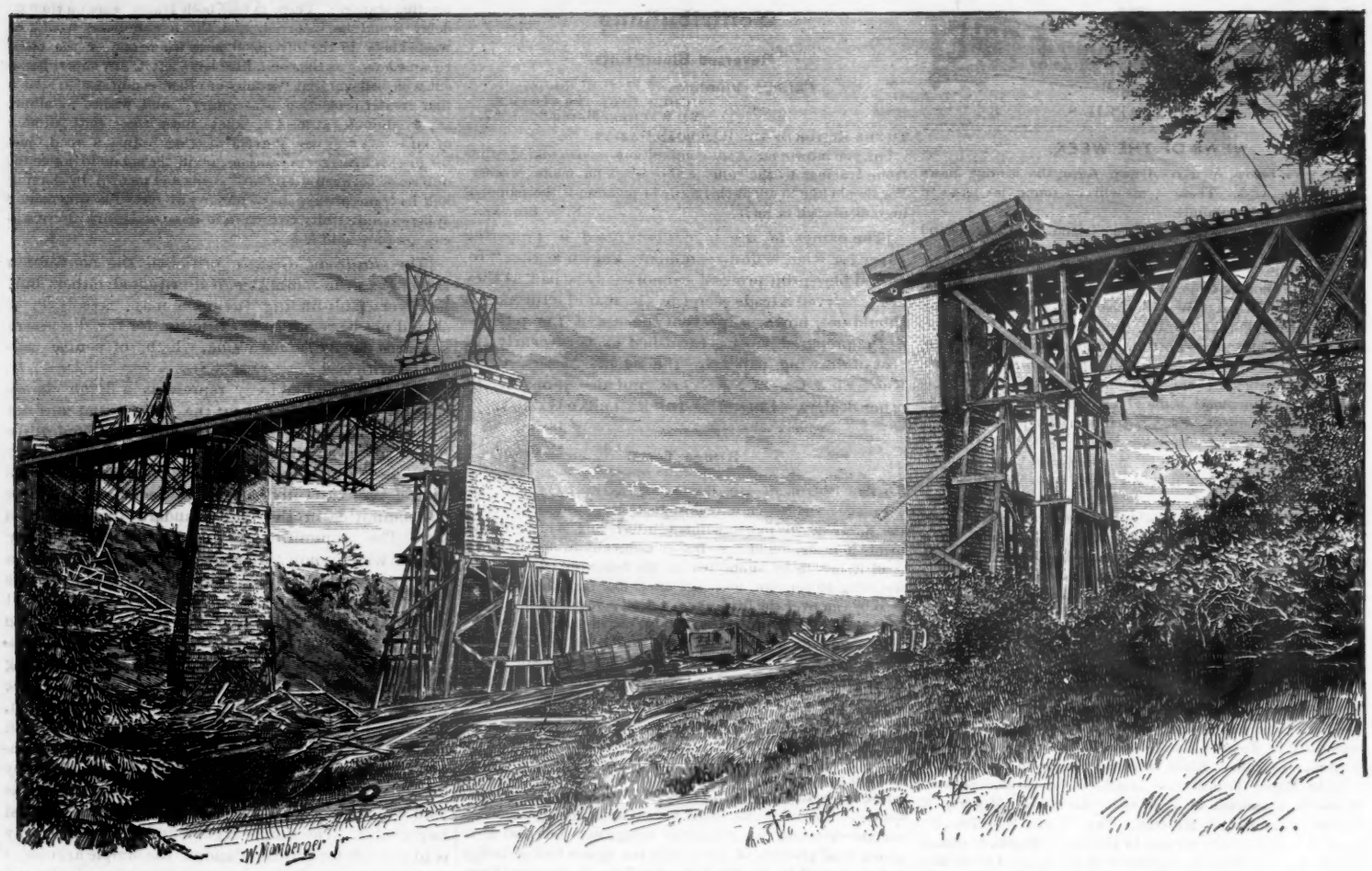
A Test of Tight and Slack Coupled Freight Trains.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I received an invitation from Mr. G. W. Rhodes, Superintendent of Motive Power Chicago, Burlington & Quincy Railroad, to attend an experimental test between the loose link and close coupler.

We left Burlington on one of their regular freight trains with two way cars, with slidometers in each car. The first five cars in the train were equipped with the air brake, which was used in connection with the hand brakes, set on the rear cars, in making all stops. There were 32 cars in all in the train as far as Creston, but from there to Pacific Junction 23 cars were all that could be hauled, owing to the continuous heavy grades on this division. The trainmen were instructed to handle the train precisely as they did every day. This trip was made with the link slack of 3 in. between each car. One of the way cars was placed near the forward end of the train and the other at the rear end of the train. Although the train was handled with care in making stops and in passing over sags in the road-bed, the shocks at times were very severe.

A second trip was made from Creston to Pacific Junction and return, with a similar train. Iron wedges were placed between the draw-bars, taking out all the link slack, thus leaving only the spring slack, as in a close coupler. The train men, the same crew, were instructed to handle the train as they had done the previous one, excepting that the braking was to be done entirely with the air brakes on the forward end of the train. In making the stops and passing over sags the shocks were hardly perceptible. At one point on the road the engineer was instructed to make an emergency stop, which he did (running at a speed of about 8 miles per hour up grade) by applying the brakes and reversing his engine. In this case the shock was no greater than a number of shocks caused by making a careful stop when the link slack was used. At another point the train was stopped on a grade of about 53 ft. to the mile, with a view of testing the question whether or not an engine could start a train, if stopped by any cause, as easily with a close coupler as with link slack, and it was proven beyond a doubt that it could be done fully as well and without the danger of breaking apart, as there was no jerk in any part of the train. We spent three days making these tests, there being present a number of officers of the Chicago, Burlington & Quincy. It was fully proven to the satisfaction of all present that the link slack in a train was of no advantage whatever, but a disadvantage as compared to a close coupler in handling a train under any conditions. X. Y. Z.



BIG OTTER BRIDGE, NORFOLK & WESTERN RAILROAD—ONE SPAN WRECKED MARCH 24, 1887.

Fall of the Bridge over Big Otter River.

The Norfolk & Western Railroad crosses Big Otter, one of the tributaries of the Staunton River, eighteen miles west of Lynchburg, Va. Until recently the crossing was made on a Howe truss timber bridge. At the time of the accident the old timber bridge was being replaced by a Fink bridge of iron. To this end the company had carried up the original piers of masonry about 20 ft. higher with brickwork. The material for the new superstructure was obtained from the "High Bridge," 5 miles east of Farmville, Va., on the same railway, where a new bridge had been recently erected. The contractors for putting up the new superstructure at Big Otter are Frederick H. Smith & Co., of Baltimore, Md. The iron work had been cut and reshaped in the company's shops at Roanoke, Va. The work had proceeded as far as the erection complete of the two eastern spans. The third span going west had been put in place, complete except the cross struts at the feet of the posts and the sway braces, instead of which temporary diagonals of plank had been fastened to the posts. This being the state of affairs on the afternoon of Wednesday, March 23, the false works were removed, and the traffic permitted to pass over the incomplete span. The fourth and last timber span remained in place.

Between Wednesday and Thursday afternoons several trains had passed safely over the bridge. On Thursday at 5:30 P. M. a heavy east-bound coal train waiting on the western side was ordered to proceed. It steamed slowly over at about 6 miles an hour. The locomotive and several cars got across safely. But as the middle of the train was on the third (incomplete) span the structure gave way, and with its load dropped vertically into the gorge below. Nine gondolas loaded with coal and the iron and timber of this span went down in ruins. The cars, of course, were demolished, the columns crippled, large numbers of the cast-iron connections broken, the tension members bent and twisted, the coal pulverized, the floor beams broken and splintered. The rear of the train was set free by the fracture of the couplings, and remained on the western side, one car hanging over the pier. The first cars were saved in the same way.

Of the train hands none fell or was injured. But of the force employed by the contractors in putting up the bridge eight men were on the wrecked span. One saved himself by a daring leap. Four were killed outright. One more died the next morning (Friday). A sixth died from his injuries on Sunday. The seventh alone was not fatally injured and is reported to be out of danger.

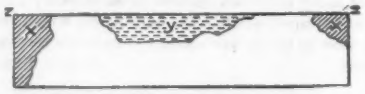
The construction and dimensions of the bridge are shown in the diagrams. Each chain consisted of a pair of parallel eye-bars of the dimensions figured.

The completed structure consisted of four parallel Fink trusses. The outside trusses were connected by cross and sway bracing, as shown. The inside trusses were stiffened on top by the floor beam connection. At bottom the cross struts were confined by rings to the posts of the inside trusses. This would serve to keep them pretty nearly in the vertical.

The load distribution between the four trusses is in the highest degree uncertain, involving the consideration of the elasticity of the trusses themselves, and of the floor beams. The problem was still further complicated by the insertion of the compressible timber block between the floor beam and the top chords of the inner trusses.

Fracture of 2½ in. by ⅝ in. Eye-bar, Eighth Chain.

Fracture in shank, near weld, 20⅛ in. from centre of eye; y shows area where metal was overheated.



Fracture of 3 in. by ⅝ in. Eye-bar, Quarter Chain

Fracture in weld 18¾ in. from centre of eye; x x show area of imperfect welds; y shows area where metal was overheated in forge. At z z were old cracks already rusted.

The quality of the material in the structure not being known no attempt was made in analyzing the structure to assign accurately the proportions in which the load was distributed among the trusses; but the hypothesis most favorable to the structure was assumed, viz.: that one-fourth of the load went to each.

On this hypothesis the greatest stress in the tension system due to a load of 2,500 lbs. to the running foot, which is very nearly the actual rolling load, was found to be about 2,640 lbs. to the square inch; the greatest stress in the compression system to be 2,250 lbs. to the square inch. The dead load would increase these by about ⅛ each; and the momentum of the rolling load at the ordinary slow speeds of the freights would add about 20 per cent.; giving total greatest stresses 4,048 lbs. to the square inch in the tension members, and 3,450 lbs. to the square inch in the compression members.

This large excess of strength above ordinary requirements probably was due on the one hand to distrust of the old metal and on the other to anticipation of heavier rolling loads and higher speeds. Perhaps a conservative imitation of the old bridge also came in.

From these it will be easily seen that the load on the bridge at the time of the fall was entirely inadequate to cause the destruction of the bridge if the work of erection had been properly done and complete and if the metal also had been of good quality.

The fact that some of the bracing had not been put in has already been mentioned. To determine the quality of the metal a careful examination was made of the fractured members. The metal of the columns appeared everywhere good, the fracture being bright and the texture manifestly excellent. The cast-iron connections also seemed to have been good, and to have been broken in the wreck itself. Of the tension members, four only were found broken—one rod and three eye-bars. The fracture of the rod and of one eye-bar was excellent. But of the other two, one (a quarter chain) had broken in the weld and showed grave imperfections in the fracture; and the other had failed in the shank near the weld where the metal gave clear signs of having been overheated. The accompanying sketches show the details of these fractures.

All the circumstances of the wreck point distinctly to the conclusion that both defects co-operated in occasioning the destruction of the bridge. The load of the heavy coal train, consisting of gondolas 31 ft. long, weighing 12 tons, and carrying about 27 or 28 tons of coal, probably overcame the initial stiffness of the joints, and canted one or more of the trusses out of the vertical in spite of the temporary sway bracing; the excessive deflection of these trusses threw an excessive load on the others, ruptured the defective quarter-chain and wrecked the bridge. The explanation seems entirely adequate and harmonizes with all the circumstances of the disaster.

If the bracing had been perfect, each of the four trusses would have aided the others and the defective member would most probably have held firm.

If the bracing alone had been defective, the wreck would in all likelihood not have happened, or, if it had occurred, the cars would have been likely to roll off on one side of the bridge instead of dropping vertically with the bridge under them.

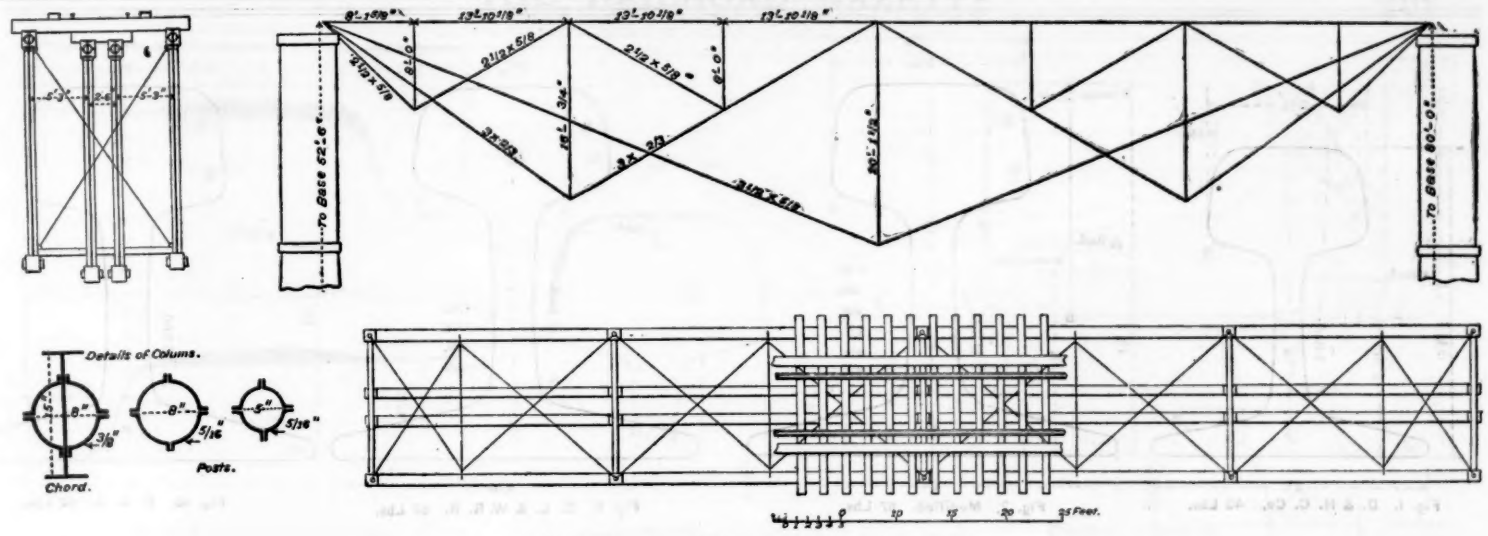
WM. M. THORNTON,
Professor Civil Engineering, University of Virginia.

BALTIMORE, April 5, 1887.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Since your correspondent was on the ground, another of my men has died, and a new coroner's jury is on, before which the true cause of the trouble stands a chance of being developed, if matters come to a head.

There will be testimony that (1st) two of my men saw a truck with its wheels down between the floor timbers about over the quarter post; that one of them called out that the train was off the track, and that three others heard him so call out; these five men escaped; and (2d) that there have been two No. 3 bars found broken in bad welds, and these bars support the quarter posts. One of these bars had a full flaw covering one-third of its section, while the two-thirds was badly burned and crystallized. The other broken bar has not been described to me yet, and there is still one No. 3 bar not yet found. There are also bars broken in the welds among the smaller ternary system, and some of these also are not yet dug out. And (3d) that these bars were all of good iron made by upsetting at the Phœnix Iron Co.'s works for Smith, Latrobe & Co., in 1869, and were erected in the Appommattox High Bridge; have carried increasingly heavy traffic until 1886, when I took them down and substituted a Pratt truss twice as strong, built by Edge Moor Iron Co., and (4th) that a portion of these bars were cut and welded by the Norfolk & Western R. R. at the Roanoke shop in pursuance of a contract consisting of an acceptance of my proposal of Aug. 21, 1886, as follows: "*For the proposed rebuilding of the Otter Creek* (4 *spans*) *and Wy Creek* (3 *spans*) *by adapting and erecting* 8 *spans of old High Bridge at Otter and* 6 *spans at Wy, I will furnish drawings and advice for and receive from you and unload at bridge sites the permanent and temporary lumber and the remodled irons and will erect the same for*" certain



BIG OTTER BRIDGE—PLAN AND ELEVATIONS.

stated dollars. All the bars not shortened by cutting and welding at Roanoke remained as originally made at Phœnix, and of these none have been fractured, so far as I am informed, although they are fearfully distorted. You will note from the above that the inspection of this welding was not in my hands; the *advice* to do the shortening by this method was given by me, as it was the quickest as well as the most economical process within reach. The Roanoke shops being locomotive builders, their blacksmiths were stated to be thoroughly reliable, and these bars were all small ones easily welded. I know that it is now held to be heretical to use welds in bridge members, but I began bridge building before upset bars were introduced, and I have removed and tested so many of these bars that have been doing double duty for years, and there are now so many important structures still carrying heavy traffic (notably the Ohio River bridge at Louisville) on welded bars, and so many bridges are yet being built on these bars (notably by the Baltimore & Ohio Railroad in their Mount Clare shops), that I am not alarmed about properly welded bars, although, of course, I greatly prefer the upset bars.

As regards the strength of the Otter Creek bridge, it is a 4 truss single tracker, Fink truss, 99 ft. 4 in. span, 20 ft. deep at the primary post, 16 ft. at the secondary and 6 ft. at the ternary. The bars of the primary system are 3½ × ⅝, and 4 bars to each truss, which gives 130,000 lbs. gross load, or 520,000 lbs. for the span of 4 trusses, and by deducting 110,000 lbs. of iron and 40,000 lbs. of deck, we have 370,000 lbs. margin left for live load, which is a large margin even under the latest specifications for general loading. The secondary and ternary systems are still heavier, as the old High Bridge was designed by Charles H. Latrobe, according to the old Fink truss rule of imposing lighter working strains on the minor systems, which were more easily affected by impact.

At the moment when this bridge was knocked out the lateral struts at the joint pins were all in, and the span was anchored laterally both ways by tackles leading to large trees, and some temporary plank sway bracing was in. The four trusses had been coupled up inside of the trestled up wooden span, which was then removed and the outer iron trusses had just been jacked out to their true positions and the struts put in, the plank bracing and the tackle guys being adjusted as the jacking progressed. Trains had been crossing all day during the movement of the trusses, and the span was in better shape at the moment of the knock-out than at any previous time that day. The two spans already completed had been handled in the same way, and the work was in charge of a first-class foreman, who had several high-priced expert bridgemen with him as bosses of his corners. This method of putting new trusses into the positions occupied by old ones is a very usual one among bridge builders, and has been practiced by men under my general directions for over twenty-five years.

I am convinced that the shock caused by the drop of one end of a car carrying 50,000 lbs. of coal broke one or more of those defective welds, and would have done so and thrown the bridge whether the full lateral system had been in or not, especially as the bridge went down vertically, not laterally: the railroad company has also trestled up the two completed spans and is negotiating for the replacement of welded by upset bars.

I take the liberty of suggesting that any publication on the subject might be advantageously postponed until the coroner's jury reaches a verdict or an adjournment *sine die*.

FRED H. SMITH.

Rail Sections *

The manufacture of steel rails in the United States upon a large scale may be roughly dated from the years 1875-76, and the same years witnessed an active movement among the railroads toward the adoption of heavier and improved patterns. In this movement * * patterns were multiplied in the most absurd and mischievous manner, until at length the burden upon the mills became well nigh unendurable, and called forth a vigorous protest in Mr. Holley's paper,† read before the Institute in February, 1881. There were then regularly manufactured in the various mills of the United States no less than 119 different patterns of steel rails, subject to current order, of which 64 per cent. were embraced under five weights per yard. Commenting upon these and other figures there given, Mr. Holley stated as the primary object of his paper, "to show that, while this multiplication of rail-patterns is an annoyance and an expense to rail-makers, it is a source of immense loss to railway companies." * *

As the average weight of the rails of 1876 was by no means excessive, the growing demands of traffic have slowly driven the roads toward stiffer sections, inaugurating a movement that now promises to become epidemic. In 1876 a 67-pound rail was a first-class equipment: to-day everything under 75 pounds is light, and many 80's are coming into use. European practice has long been heavier than ours; in part because the higher cost of sleepers has led to an average of 3 ft. spacing, instead of 2 ft. as with us. The old 84-pound double-header, and Sandberg's 80 and 89 pound rails, respectively 5¼ in. and 5½ in. high, are reported common on English roads; and he is strongly advocating the general adoption of the 100-pounder shown in fig. 7. * * In this movement toward the adoption of heavier patterns, both rail makers and rail purchasers have reason to dread a repetition of the folly of past years. The multiplication of designs will be even less excusable now, because we have an accumulated experience upon many disputed points, both of manufacture and wear, and can, moreover, design with reference to the standard car wheel tread and flange adopted by the Master Car-Builders' Association in October last by the decisive vote of 411 to 91. The facts above cited, the long gap in our publications upon this topic, and the current efforts of a committee of the Civil Engineers to gather the materials for a report seem to make this paper timely.

In a letter to the *American Journal of Railway Appliances*, July 15, 1885, I described a 43-lb. rail designed for the Delaware & Hudson gravity system (see fig. 1), in which the line of minimum thickness of web was above the midway position usually assigned to it. But as this rail was much below average weight, and the design was hampered by conditions, another was shown (fig. 2) differing only in web from the so-called P. R. R. 67-lb. (fig. 3), in which the principle was carried to the limit, and the minimum line placed fairly on the neutral axis. Quoting from the letter referred to, "There are two principal reasons why this system should be an improvement. The most obvious is in relation to the duty which the rail has to perform as a girder. American rails are universally weak against vertical stress, and every ounce of useless metal that can be crowded down into the flange will help to remedy this defect. The second reason is that it puts the section in better form to resist the lateral thrust of a flange. For instance, a force F, fig. 3, acts at $x\ y$ with leverage $A\ B$. But if F be sufficient, the rail will yield on a line lower than $x\ y$, because the increase of section to the fillets is not commensurate with the increase of leverage. The web of fig. 2 has been so proportioned that, if $x\ y$ be laid off at the same depth from the tops as in fig. 3, the thickness will be found the same, viz., ½ in.: but from $x\ y$ downward, the increase in fig. 2 substantially keeps pace with the leverage. It may be urged against the first reason given that the neutral axis is constantly being lowered as the rail wears. But it is better that during the life of the rail the line of minimum thickness should average above rather than below the neutral axis, because of the influence which its position has upon the resistance of the rail to lateral thrust."

The areas, and consequently the weights, per yard, of figs. 2 and 3, are the same; but the moment of inertia of fig. 2 is 18.079, while that of fig. 3 is but 17.319, and as the resistance of beams to deflection is directly as the moments, it appears that by the modification of web, without adding to the weight per yard, we have stiffened the Pennsylvania rail some 4.4 per cent.*

A calculation of these rails for ultimate resistance to bending loads has been made in accordance with a method given by Benjamin Baker in his book on beams, columns and arches. Assuming the tensile resistance of the metal to be 80,000 lbs. per square inch, the breaking load of fig. 3 is calculated to be 116,935 lbs., and that of fig. 2 to be 122,090, an increase of 4⅓ per cent.

The following method has been adopted to institute a comparison between these two patterns in their resistances to lateral flange-thrust. When the rail is securely fastened to the sleepers and the thrust of a wheel flange is delivered as indicated by the arrows (figs. 2 and 3), the rail resists as an overhung beam or cantilever. If the thrust is delivered by only an occasional wheel at considerable intervals, the stress upon the web at the plane of delivery will be lessened by the resistance of the head to lateral bending, which will distribute the stress. But this need not be considered, because we are to deal with the severest conditions likely to occur in the track; and where a number of contiguous wheels are thrown together against a rail, the loading is practically uniform throughout its length, and the head would be thrust aside bodily but for the web resistance, which may be studied with reference to sectional moments alone. The usual formula for the deflection of a cantilever is $\delta = \frac{W L^3}{3 E I}$. But I in our case $= \frac{bt^3}{12}$, in which t equals thickness of web and b = length with the rail = 1. Substituting, we have $\delta = \frac{W L^3}{3 E \frac{t^3}{12}}$ in which the only variables are $L^3\ t^3$. For comparative purposes we may eliminate the constants and have δ is as $\frac{L^3}{t^3}$ and the resistance, being inversely as the deflection, is as $\frac{t^3}{L^3}$. By multiplying all results by 100,000, we obtain comparative quantities free from decimal fractions. The first step is to obtain the length L of the lever arm ($A\ B$, figs. 2 and 3), measured vertically from the contact of wheel-flange to the plane of whichever section of web is to be calculated. For the point of wheel contact I have bisected the curve at upper corner of head. The two patterns under consideration tabulate as follows, the trial sections being numbered from the top down.

Sections.	Values of L.		Values of t.		Values of $\frac{t^3}{L^3}(100{,}000)$	
	Fig. 2.	Fig. 3.	Fig. 2.	Fig. 3	Fig. 2.	Fig. 3.
1.....	2.09	2.53	.469	.5	1131.	772.
2.....	2.34	2.78	.475	.508	836.	610.
3.....	2.59	3.03	.495	.531	698.	538.
4.....	2.84	3.28	.525	.57	632.	574.
5.....	3.09	3.53	.569	.626	624.	557.
6.....	3.34	....	.625	....	658.	

Taking the minimum values of $\frac{t^3}{L^3}$ we get comparative resistance to lateral flexure of fig. 2 to fig. 3 nearly as 6 : 5.

Attention is here called to the table of deflections, for which I am indebted to Mr. John W. Cloud, lately Engineer of Tests, Pennsylvania Railroad Company. The No. 2 rail of the table is fig. 3, and No. 4 is fig. 10.

Bending Tests of Steel Rails.

BY MR. JOHN W. CLOUD, ENGINEER OF TESTS, PENNSYLVANIA RAILROAD CO., ALTOONA, PA.

Description of test.	Weight per yard	Deflection in inches with loads in thousand pounds of																Permanent deflection
		5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	
No. 2 Rail, Two supports, Cambria	New 68¼	.03	.03	.04	.04	.04	.05	.06	.07	.07	.07	.07	.08	.08	.08	.08	.10	.01
Do	do.	.02	.02	.03	.03	.04	.04	.05	.05	.05	.05	.06	.06	.07	.07	.07	.07	.00
Do	do.	.03	.04	.04	.04	.06	.06	.06	.06	.08	.09	.10	.10	.11	.11	.12	.12	
Do.—Inverted	do.	.01	.02	.03	.04	.04	.04	.04	.05	.05	.06	.06	.07	.07	.08	.08	.08	.00
Do. do.	do.	.02	.02	.03	.03	.04	.05	.05	.06	.06	.07	.08	.08	.08	.09	.09	.10	.01
Do. do.	do.	.02	.02	.02	.03	.03	.04	.04	.04	.04	.04	.05	.05	.06	.06	.07	.07	.01
No. 4 Rail, Two supports, Cambria	New 70	.01	.02	.03	.03	.03	.03	.04	.04	.04	.05	.05	.06	.06	.07	.07	.08	
Do	do.	.01	.02	.02	.03	.03	.03	.04	.04	.04	.05	.05	.05	.06	.07	.07	.08	
Do	do.	.01	.02	.02	.03	.03	.03	.04	.05	.05	.06	.06	.06	.07	.07	.08	.11	
Do.—Inverted	do.	.02	.03	.04	.04	.03	.05	.05	.05	.06	.06	.06	.07	.08	.08	.08	.08	
Do. do.	do.	.01	.01	.02	.03	.04	.04	.04	.04	.05	.05	.05	.05	.06	.06	.06	.07	

NOTE.—The rails tested, with a clear span, were placed on supports 19" apart, reducing by the shape of the support to 15" apart, by bending about ⅛", after which the distance between supports remained at 15". The load in all cases was applied midway. The pressure-block above was cylindrical, with 16⅛" radius.

* The moment of inertia of fig. 2, deduced from Baker's method of obtaining the moment of resistance, is 18.153. That of fig. 3 is 17.541, showing the same percentage of increase.

* A paper read by W. F. Mattes, at the Scranton meeting of the American Institute of Mining Engineers, February, 1887. Published subject to revision.

† "Rail-Patterns," *Transactions*, ix., 360.

Fig. 1. D. & H. C. Co. 43 Lbs.

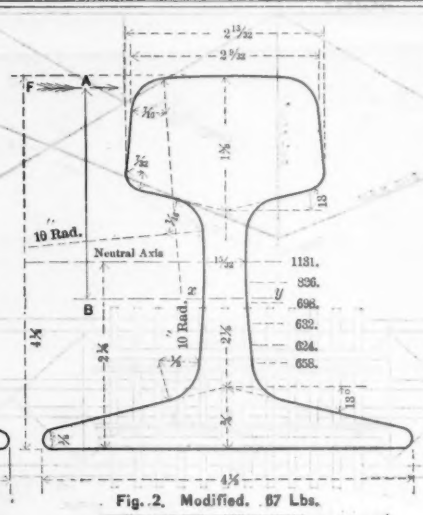


Fig. 2. Modified. 67 Lbs.

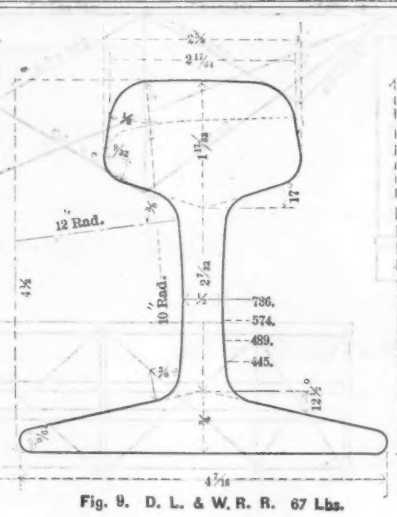


Fig. 9. D. L. & W. R. R. 67 Lbs.

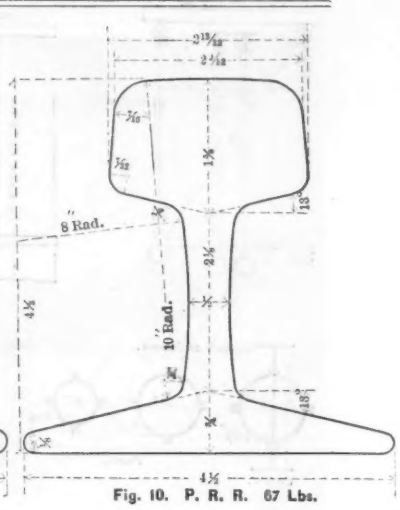


Fig. 10. P. R. R. 67 Lbs.

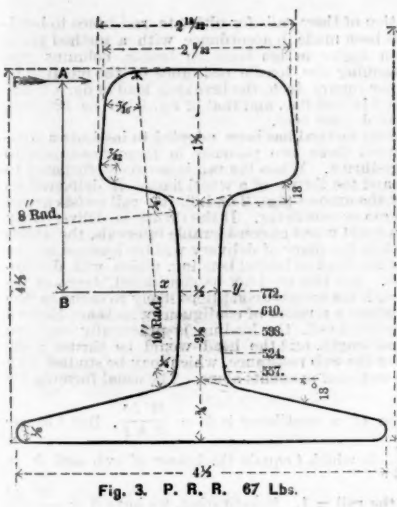


Fig. 3. P. R. R. 67 Lbs.

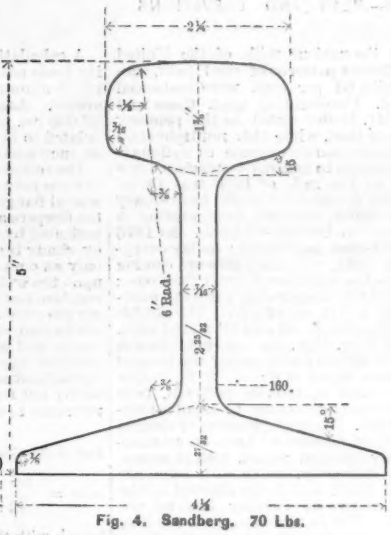


Fig. 4. Sandberg. 70 Lbs.

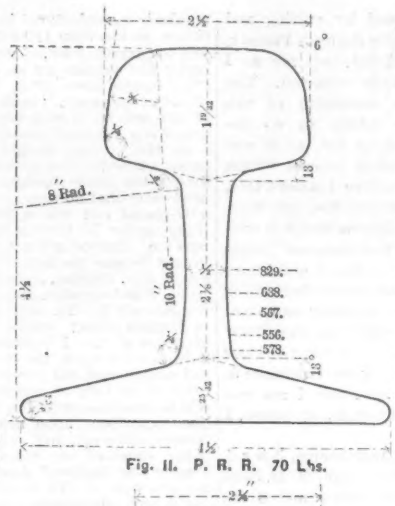


Fig. 11. P. R. R. 70 Lbs.

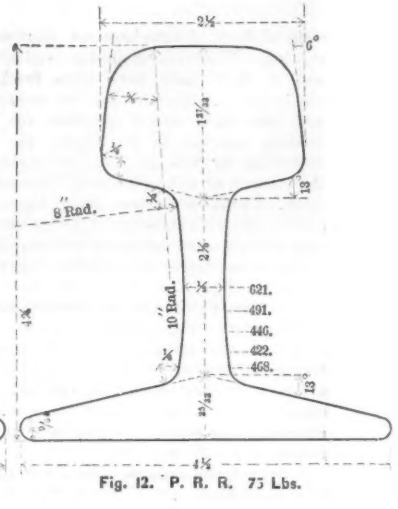


Fig. 12. P. R. R. 75 Lbs.

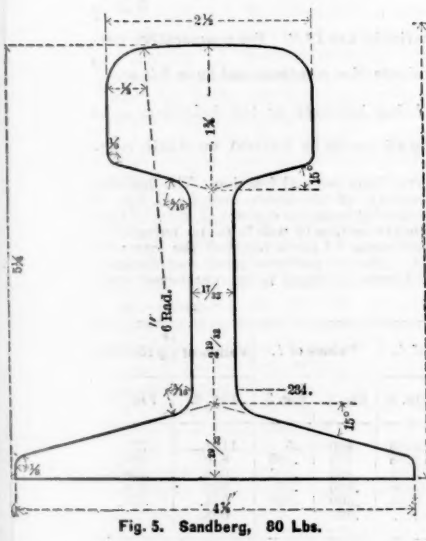


Fig. 5. Sandberg, 80 Lbs.

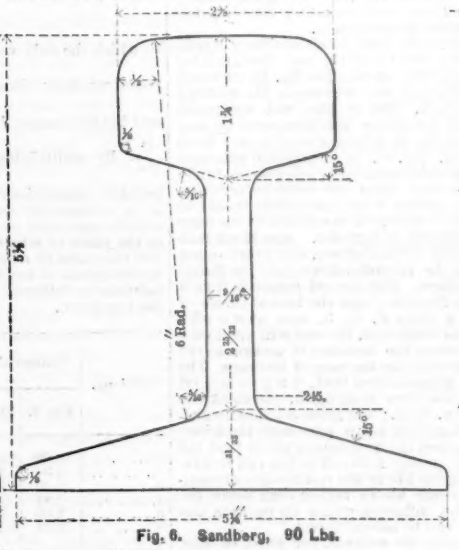


Fig. 6. Sandberg, 90 Lbs.

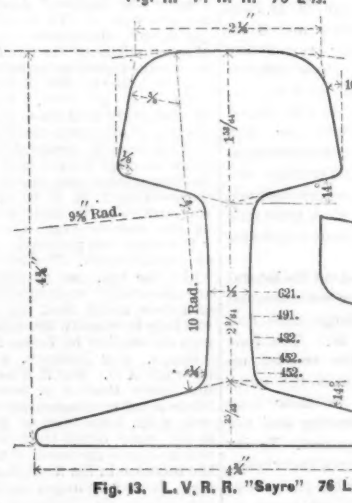


Fig. 13. L. V. R. R. "Sayre" 76 Lbs.

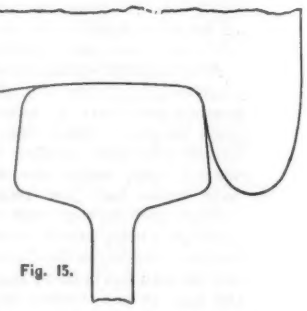


Fig. 15.

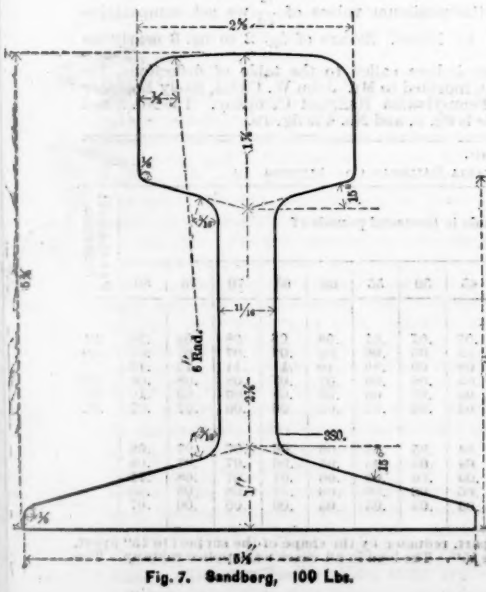


Fig. 7. Sandberg, 100 Lbs.

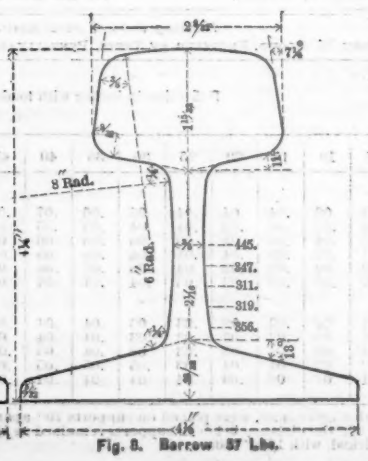


Fig. 8. Barrow 57 Lbs.

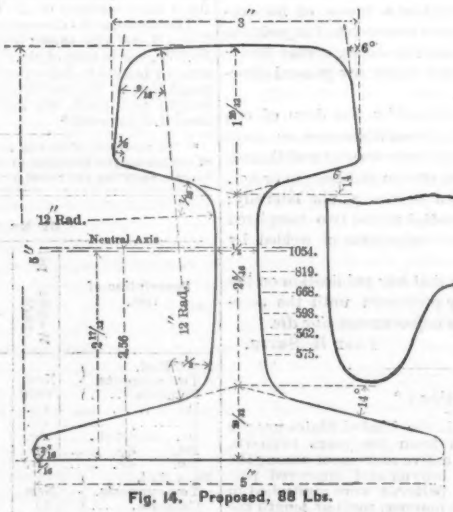


Fig. 14. Proposed, 88 Lbs.

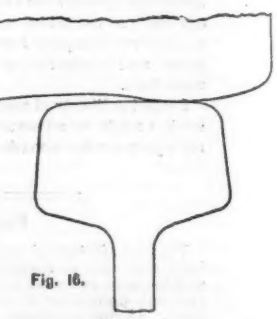


Fig. 16.

RAIL SECTIONS—W. F. MATTES.

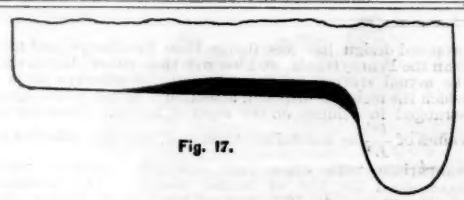


Fig. 17.

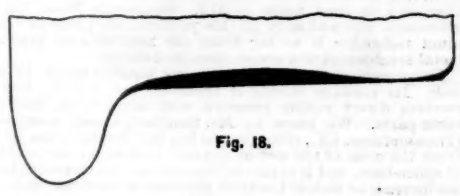


Fig. 18.

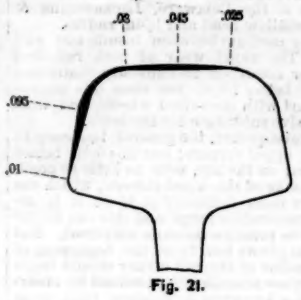


Fig. 21.

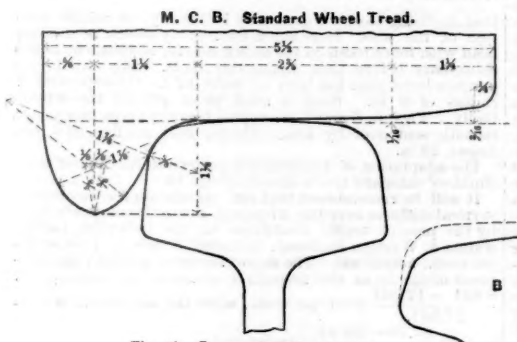
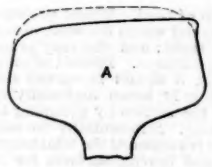


Fig. 19. Proposed Rail, 88 Lbs.



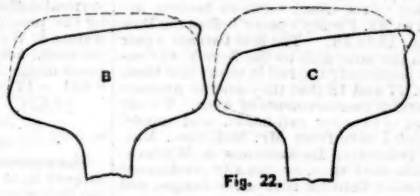


Fig. 22.

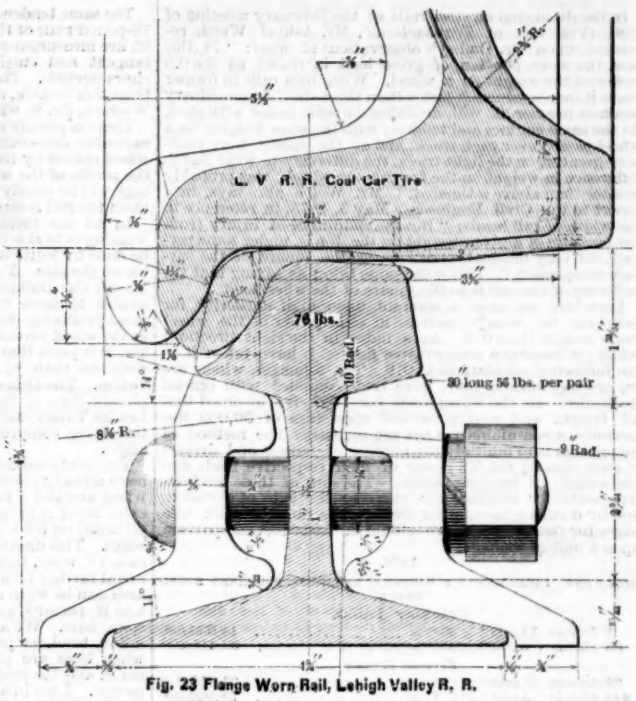


Fig. 23 Flange Worn Rail, Lehigh Valley R. R.

Fig. 24

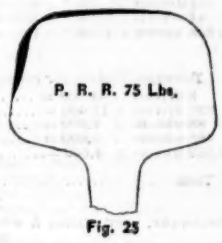


Fig. 25

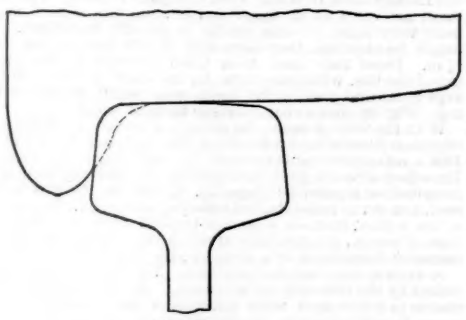


Fig. 20.

Fig. 26

RAIL SECTIONS—W. F. MATTES.

The tabular deflections are all largely in excess of those called for by any formula known to me; and an attempt to harmonize them is complicated by an uncertainty as to the actual distances between supports. They reverse the order of previous records, in that the deflection per unit of stress is greater with the lighter loads. They are sufficient under ordinary wheel loads to indicate a serious increase of train resistance. According to the table, a locomotive driver, loaded to 17,000 lbs., will deflect a No. 4 (70-lb.) rail about .025 in. in a span of 19 in. This is a static deflection, which will be augmented by the rolling load, but the static deflection alone is equal to an opposing grade of 14 ft. per mile.

Mr. Cloud's table is confirmatory evidence of that which we already know, viz., that the rails of about 68 lbs. weight so largely put to use in 1876 were rather weak vertically, even for the loads and speeds of that date. But taking the Pennsylvania 67, which, like the Delaware, Lackawanna & Western, really weighs 68⅛ lbs., as the best available basis for comparison, two leading questions are presented. If the 67-lb. rail gave about the proper degree of stiffness for the traffic conditions of 1876, by what percentage should that stiffness be increased for the probable conditions of 1887–88? And if the conditions of 1876 produced a certain wear per unit of tonnage, what will the conditions of 1887 produce upon the same rail?

Taking these questions in order, I will endeavor to prove that the deflection of rails in the track is probably directly as the wheel-loads, and the squares of running speeds.

In authoritative formula for the deflection of beams, the bending load figures directly, and therefore the first part of the above proposition requires no argument. The normal resistance to the rolling load, after inertia has been overcome, is due to a slight roughness of the metal surfaces, which may be likened to minute gear-teeth, of irregular pitch, in continual collision. Next in order comes a series of abnormal resistances due to actual mechanical imperfections in the surfaces, deviations from a true circle in the wheels, flat spots worn by skidding, etc. Third, a resistance from imperfect counterbalancing of wheels and drivers, particularly the latter. The dynamic effects of these abnormal forces upon the rails may be treated as a single group, and illustrated by fig. A, which represents a wheel upon the rail. At **A** is an imperfection, a protuberance, a flat spot or an unbalanced weight, either of which will deliver a blow upon the rail at **B**. Considering **A** as a weight, represented in the equations by mass M, as its fall upon the rail is mechanically controlled, we have to deal only with its velocity V, which varies as the speed of the train. Now the fundamental analogy in dynamics of matter is $M : F = T : V$, in which F represents a force and T time, from which we have $FT = MV$ and $FTV = MV^2$. If K represents work done we know that $K = FTV$, therefore $K = MV^2$. Or as Nystrom expresses it, "the work consumed in giving the mass M the velocity V, is FVT," which equals MV^2; and hence, when M is constant, varies as V^2. But the work done in stopping a moving body, or in absorbing the momentum of a moving body, is necessarily equal to the work done in producing the motion; and as the work done in giving different velocities to **A** is proportioned to the square of those velocities, therefore the work done by the rail, of which the deflection is the measure, also varies as the square of the speeds. Mechanical defects in the rails are only the counterpart of similar flaws in the wheels, and the dynamic effect will be governed by the same law.

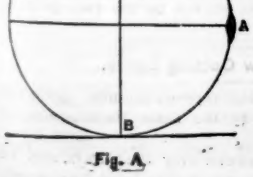


Fig. A.

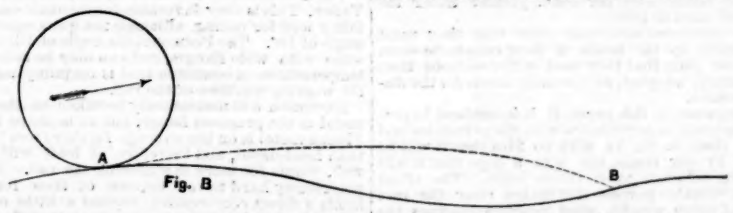


Fig. B

The fourth series of resistance may be assigned to imperfections in the alignment and support of the rails, and to the deflection of the rails under the load; and our examination must proceed in line with the theory of projectiles. In fig. B we suppose the driving-wheel to be passing a high spot in the track. At a certain velocity the tendency is to leave the rail at **A** and strike again at **B**, producing a deflection proportioned to the vertical height of the fall. Now, it is not essential to this result that the wheel shall actually leave the rail. The elastic reaction of the latter causes it to rise as the pressure of the wheel is relieved, and the ballistic tendency of the locomotive body is provided for by an extension of the driving springs. If both track and locomotive were incompressible, the wheel would rise from the rail. The elasticity of both mitigates the destructive power, but does not reduce the actual work performed, of which the vertical height of the rise, in the first supposition, is the variable factor, and varies as the square of the resultant velocity, which, in our case, is the speed of the train. Rankine says of projectiles, "The relation between the variation of vertical elevation and the square of the resultant velocity is the same, whether the velocity is in a vertical, inclined, or horizontal direction."* Whether the projecting velocity V be vertical or inclined, the height to which the projectile will reach will be $S = \frac{V^2}{2g}$, and we shall have with different velocities $S : S_1 = V^2 : V_1^2$. Our case is analogous to that of a body falling freely upon a spring.† The weight W in fig. C, falling through space S will compress the spring through space s. If F denotes the mean force of the spring, we have $W : F = s : S$ and $WS = Fs$. But Fs is the measure of the work done in compressing the spring, which compression corresponds to the deflection of the rail, and as S varies as V^2 the deflection must vary as V^2 also.

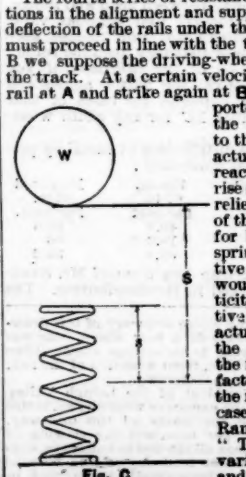


Fig. C

For a practical application, we will take the southern-bound track of the Delaware, Lackawanna & Western Railroad out of this city, selecting for each year the maximum driver load and average speed of fastest trains.

$$\left.\begin{array}{l} \text{1876.} \\ \text{Driver-load. Speed.} \\ 14{,}000 \times 30^2 = 12{,}600{,}000 \\ \\ \text{1887.} \\ \text{Driver-load. Speed.} \\ 17{,}000 \times 35^2 = 20{,}825{,}000 \end{array}\right\} \text{The ratio is } \frac{20{,}825}{12{,}600} = 1.65.$$

Calling for an increase in vertical stiffness of 65 per cent.

The second question which I have undertaken to discuss relates to the wear of rails, and the treatment must be partly empirical. The dynamic force called into action is represented by MV^2, in which M is a constant, because it is a function of the tonnage, for which we have assumed a common unit. Hence, other things being equal, the force which produces abrasion varies as the square of running speeds. We may liken the wheels to a chisel, which, being struck by a hammer of given weight, produces an effect which varies as the square of the velocity of the hammer-head. But we may also vary the effect by a change of chisels. It will make a difference whether the force of the blow is confined to a sharp edge, or distributed over the larger surface of a blunt one; and so it will make a difference in the abrasion of rails, whether the given tonnage be distributed over many wheels or concentrated upon a few. Hence, observers have sought to ascertain the relation that exists between wheel loads and wear.

* "Applied Mechanics," p. 489.

† Nystrom's "Elements of Mechanics," p. 139.

In the discussion on steel rails at the February meeting of 1881 (Vol. IX. of *Transactions*), Mr. Ashbel Welch remarked upon Dr. Dudley's observations of wear: "In this case, the wear per ton of gross load increased as the 0.6 power of the weight on a wheel. With iron rails in former years it increased much faster than this rate. As machinery becomes heavier it will doubtless increase faster with steel. As the same engines and tenders, with the same weights on a wheel passed over each track, and as the speeds were probably greatest on the light track, the difference in wear due to difference in weight on the freight car wheels was probably greater than above estimated." Mr. Welch also says, in a report to the Civil Engineers, May 5, 1875, in reference to the width of rail heads: "But the endurance of injury from the pressure of a given weight on the top is, under some perhaps not very unusual conditions, as the square of the surface compressed." This is the same thing as saying that the suffering of the rail is as the square of the wheel load.

Here then we have a warrant upon high authority for believing the wear to increase in some power of the wheel loads greater than 0.6. As a move in the right direction, while yet keeping a conservative figure, I have taken it in the following calculations at 0.8. The tonnages, which are for one day in each year, have been compiled with official assistance. In the wheel loads for 1887, it is assumed that all freight and coal is carried upon cars of 50,000 lbs. capacity, a consummation not yet realized. The method of calculation is to multiply the number of wheels and drivers of each class by the 0.8 power of their respective loads and the square of running speeds. The sum of these products represents, for comparative purposes, the rate of abrasion; and by dividing the sum for 1887 by the ratio between tonnages for the two years, we obtain a basis for comparison upon a unit of tonnage.

1876.

DELAWARE, LACKAWANNA & WESTERN RAILROAD, SOUTHERN BOUND TRACK.

Passenger Trains.

8 drivers $(14.000^{.8} \times 30^2) =$	14,936.000
88 wheels $(6,000^{.8} \times 30^2) =$	83,415,000

Freight Trains.

28 drivers $(11,600^{.8} \times 12^2) =$	71,959,000
444 wheels $(5,000^{.8} \times 1.^2) =$	58,066,000

Coal Trains.

264 drivers $(11,600^{.8} \times 10^2) =$	23,976,000
44 wheels $(5,000^{.8} \times 10^2) =$	3,596,100
3,859 wheels $(4,000^{.8} \times 10^2) =$	328,610,000
	584,958,300

Tonnages (taken, for convenience of reference, in pounds).

8 drivers × 14.000 =	112 000
29½ drivers × 11.600 =	3,387,200
88 wheels × 6,000 =	528,000
488 wheels × 5,000 =	2,440,000
3,859 wheels × 4,600 =	17,751.400
Total	24,218,600

1887.

DELAWARE, LACKAWANNA & WESTERN RAILROAD, SOUTHERN BOUND TRACK.

Passenger Trains.

28 drivers $(17,000^{.8} \times 35^2) =$	83,110.000
364 wheels $(7.000^{.8} \times 35^2) =$	531,270,000

Freight Trains.

36 drivers $(14,008^{.8} \times 16^2) =$	19,118,130
580 wheels $(9,000^{.8} \times 16^2) =$	260,053,100

Coal Trains.

280 drivers $(12,500^{.8} \times 10^2) =$	53.050,000
3,494 wheels $(9,000^{.8} \times 10^2) =$	509,000.000
Total	1,455,601,230

Tonnages (taken, for convenience in reference, in pounds).

28 drivers × 17,000 =	476,000
36 drivers × 14.000 =	504.000
280 drivers × 12,500 =	3,500,000
364 wheels × 7,000 =	2.548.000
4,074 wheels × 9,000 =	36.666,000
Total	43,694,000

Ratio of tonnages (1876 to 1887) $= \frac{43,694,000}{24,218,600} = 1.804.$

$\frac{1,455,601,230}{1.804} = 806,874,296$, which is the sum of our product for 1887 corrected to the tonnage basis of 1876. Dividing this by the sum of the products for 1876, we get $\frac{806,874\ 296}{584,958,300} = 1.38$, which is the ratio of wear of rail per unit of tonnage under the respective traffic conditions of the years in question. That is to say, the wear of the rails for each gross ton of traffic is 38 per cent. greater under the conditions of 1887 than in 1876.

Our railroads discovered some time since that they must provide more metal in the heads of their rails to be worn away, but it is also plain that they need stiffer sections than have yet been largely adopted, and broader heads for the distribution of pressures.

As a logical sequence to this paper, it is incumbent to present a section designed in accordance with the principles laid down. This is done in fig. 14 with no idea that it will be adopted bodily by our roads, but with a hope that it will exert a modifying influence upon future rails. The effort will also serve a valuable purpose if it makes clear the fact that, for a rail of given weight, good practice confines the designer within very narrow limits, and thereby emphasises the folly of multiplying patterns for minute differences, between which no man can authoritatively decide.

A noticeable change in the practice of our leading roads in the past few years, has been in increasing the radii of the upper corners of the heads. This was done to mitigate the rapid sharpening of wheel-flanges, as illustrated by fig. 20. Instead of radii of ⅝ in. and ⅞ in. the practice jumped to ⅝ in., which was, and is, the favorite radius for wheel-throats, thus making the rail fit the wheel. My observations upon the effect of this change are, that the principal has been carried a little too far, especially in the Lehigh Valley rail, fig. 18, in which the ⅝-in. curve was supplemented by a side slope of 10°. Wheel-tires that are in good condition will have little effect upon such a head, beyond that which is properly due to the rolling load, but tires worn as in figs. 15, 17 and 20, produce abrasion of the side slope that is very noticeable on tangents and severe on curves. Fig. 21 shows the wear of some of these rails, which were laid in May, 1884, on a tangent near Pittston. The track there is double, fairly ballasted, and the traffic not particularly heavy. The figures give the wear in decimals of an inch, and the noticeable feature is that the wear is deeper on the side than on the top. Upon the next curve, of about 2°, the excess of side wear was still greater, and upon heavier curves at Mauch Chunk it was decidedly objectionable.*

*Since the above was written a correspondent of the *Railroad Gazette* has furnished that paper with a cut of the Lehigh Valley rails at Mauch Chunk referred to, which is reproduced in fig. 23. The rails were removed in June, 1886, and at the time of my examination I was unprovided with tools for measurement; but upon the strength of that inspection, and subsequent observations made with the aid of templates, upon many Lehigh Valley and other rails, I am constrained to doubt the entire accuracy of this drawing. It shows the rail worn to closely fit a new wheel, whereas the invariable tendency is to wear to an *average* wheel. [The drawing was made, with great care, from a section of the rail, and was accurate.—EDITOR RAILROAD GAZETTE.]

Mr. R. H. Sayre, Second Vice-President of the Lehigh Valley Railroad Company, accounts for the excessive wear shown, in this way: The rails are on a 14° curve, the trains all run one way, with a descending grade of 12 ft. per mile, and the slowing of trains as they pass the station brings all the inside buffers in contact, thereby increasing the tangential tendency of the wheels. It is very probable that the wear has been greatly aggravated in the manner stated by Mr. Sayre, but the fact remains, that upon other and lighter curves, and upon tangents, this pattern shows an excess of flange wear.

The same tendency is observable in less degree in the 70 and 75-pound rails of the Pennsylvania Railroad. Figs. 24 and 25 are measurements taken west of Coatesville station, upon tangent and outside of light curve respectively, and are characteristic. The old 67, fig. 10, was comparatively free from this trouble, and so is the Delaware, Lackawanna & Western, fig. 9, with its shallow head and ½-in. radius.

There is plainly a happy medium between insufficient and excessive side-contact. The rapid wear of both rail and wheel caused by the latter condition undoubtedly maintains the profile of the wheel in better form, but even this advantage will be chiefly realized with steel-tired wheels, and with them the rail is an expensive substitute for the lathe.

In all the forms of rails quoted, the general tendency in wearing is to sharpen the upper corners; but this had better be done by legitimate wear on the top, with as little as possible on the side. For the sake of the wheel-throats, which the Master Car-Builders have fixed definitely at ⅝ in., it is desirable to have the corner-radius large, and this can be the more profitably done as the practice becomes universal. But as the wheel-throat radius grows less from the beginning of use, it is plain that the radius of the rail corner should begin with less than ⅝ in., a view abundantly sustained by observation. The Delaware, Lackawanna & Western rails show plainly that ½ in. is not, and the later Pennsylvania and Lehigh Valley rails indicate that ⅝ in. is too large. I have, therefore, compromised on $\frac{9}{16}$ in., retaining the 6° side-angle.

The next consideration is width of head. Wheel pressures have already passed the limit beyond which the wear of both wheel and rail is uncomfortably rapid; and the only practicable relief is in broader bearing-surfaces. Instead of piling up metal on the tops of rail-heads, it should be spread sideways. This disposition will not only lessen materially the rate of wear, but will stiffen the section by grouping the metal farther from the neutral axis. Substantially the same area can be worn away with less reduction of the total height, and it permits greater depth and bearing-surfaces for the splice-bars. We are so accustomed to our usual patterns that a 3-in. head, as proposed, strikes the eye unpleasantly. But when tires are placed upon them a transformation takes place, and the inadequacy of the usual surfaces become apparent. I am indebted to Mr. Forney's paper before the Master Car-Builders for figs. 15 to 18. The first two are a pair of wheels removed from the same axle on the New York Central, and also represent accurately the rail in use at that time. Mr. Forney says of figs. 17 and 18 that they are the average of a large number of careful measurements of wear. To my mind they show the need of broader rail-heads, and supplement the testimony which I have from Mr. McKenna, Master Car-Builder of the Delaware, Lackawanna & Western, that chilled wheels, unlike steel tires, are usually condemned for wear of the treads rather than for that of the flanges, and this with comparatively sharp-cornered rails. For the lower corner of head I have adopted ⅛-in. radius, which is as sharp as the good of the rolls will permit, and gives all possible bearing-surfaces for the splice-bars. Why the Pennsylvania people increased the radii of their under corners, while retaining the splice-bars, is beyond my ken.

Without at all considering the merits or demerits of any class of joints, it is proper to notice the argument advanced by certain advocates of the Fisher joint, and the adoption of splice-bars has forced a design of rail in which the metal is not distributed to the best advantage. This statement is correct to only a very limited extent, and whenever the bounds set in reference to height and weight are so proportioned to the duty to be exacted as to permit a rational design of both rail and splice, the influence of the latter as a factor of importance will disappear. For instance, if the Fisher joint should be universally substituted for the angle-bars, the only consequent modification of the proposed section to be recommended would be a small increase of the radii of the lower head-corners, and of the upper fishing angles to about 17°, reducing the weight perhaps 1 pound per yard, with a slight loss in vertical stiffness. It is true that current patterns have suffered in design by the cutting away of fillets to obtain bearing-surfaces; but this is the natural result of narrow heads, which are in themselves evils to be corrected.

Nothing like a return to the old pear-head is to be thought of. We require a certain rectangular section for bearing-surface as wear proceeds, and to pack more metal underneath than liberal fillets, and say 17° angles provide, is sheer waste. It is not more true that the requirements of splice-bars led to the adoption of current patterns, than that the properties of steel permitted it for other, and equally valuable, considerations. The Delaware, Lackawanna & Western rail, fig. 9, as worn to the dotted lines, is still in use under the heaviest traffic, and yet the flattening of the fishing-angle is hardly measurable with the template. The fillets for fig. 14 are ample for rolling, and for the transmission of both cooling and working stresses.

The fishing-angles are taken at 14°, the same as the Lehigh Valley. This is very favorable for the angle-bars, and answers fairly well for rolling, although not quite equal to Sandberg's angle of 15°. The Pennsylvania angle of 13° is very troublesome with wide flanges, and can only be rolled at quite high temperatures—a condition that is certainly not favorable to the wearing qualities of the rail.

Exception will undoubtedly be taken to the percentage of metal in the proposed flange, but it is there for a purpose. Flange metal is on the average farther from the neutral axis than head-metal, and therefore, at least with this form of web, counts for more in stiffening the rail. Thin flanges are notoriously hard to roll, because of their form, which prohibits a direct compression, beyond a little edging, and because they cool quickly. Aside from the effect of strains set up by difference in time of cooling between head and flange, upon which our information is meagre and opinions vary, there is the point raised by Sandberg that thin flanges keep the carbon down, and we all know that they keep the rolling temperatures up. So, gentlemen of the railroads, if you want hard and dense rails, do not call for flatter angles and thinner edges than this design indicates for bases of that width, and do not call for less than 14° for any width whatever.

The following table shows the distribution of metal by percentages in three of the patterns illustrated:

	Sandberg's 100 lb. Per cent.	Penna. 67 lb. Per cent.	Proposed 88 lb. Per cent.
Head	43	49.4	49.8
Webb	22	18.2	16
Flange	35	32.4	34.2

The divergence between American practice and Mr. Sandberg's latest design is very marked in the distribution. The proposed design has less flange than Sandberg's, and more than the Pennsylvania, and less web than either; but to show the actual stiffness of the web, and the effective style in which the metal is disposed, attention is called to the figures arranged in column on the right of fig. 14. These are the values of $\frac{t^3}{L^3}$ as heretofore explained, and are intended for comparison with other rails similarly marked, which have stood the test of actual service. The minimum of this section is 562, that of the Lehigh Valley 432, Pennsylvania, 422. Fig. 8 is from a lot that recently passed through Scranton, and was rolled at Barrow, England, for an American road. The web attracted attention, and its least value is 311. Sandberg's 70-lb., fig. 4, gives only 160, and as in all his patterns, the plane of minimum resistance is so far from the neutral axis that the metal is subjected to a severe combined stress.

The objections to thin flanges do not equally apply to the web. Its position shields it from as rapid cooling, and it receives direct rolling pressure with more work than the other parts. We know by Mr. Sandberg's own testimony (*Transactions*, IX., 602), that he has had trouble at the joints from the wear of the web at top and bottom by the rubbing of splice-bars, and it is fair to suppose that his disproportionate increase of web in the later patterns is based on such experience. Even in these, the great height and parallel web-section keep the values $\frac{t^3}{L^3}$ quite low, and it does not appear that anything has been gained by increasing the middle portion of the web. Here again the remedy should be a wider head with more room on the under side for adjustment of the splice-bars before they strike the fillets. Mr. Sandberg's practice heretofore has been to make all his rail-tops with a radius of 6 in. Such a head must groove the wheels badly. Figs. 5, 6 and 7 are copied literally from blue-prints recently sent over by him. The top radii are figured 6, but drawn 12 in.

The adaptation of the proposed pattern to the Master Car-Builders' standard tire is shown by fig. 19.

It will be remembered that the calculation for increase of vertical stiffness over the 67-pound Pennsylvania, called for by the present traffic conditions on the Delaware, Lackawanna & Western Railroad, indicated a ratio of 1.65, or 65 per cent., additional. The actual increase given by the proposed design is as the respective moments of inertia, viz, $\frac{8.841 - 17.541}{17.541} = 64$ per cent., while the increase in weight is only $\frac{87.70 - 68.44}{68.44} = 28$ per cent

The punishment which sleepers receive when compelled to support light rails under heavy loads is well illustrated in the Delaware, Lackawanna & Western track eastward from the Lackawanna Iron and Coal Company's office. The rails there are worn as in figs. 9 and 22, and the section, originally very light for this traffic, is greatly weakened. As might be expected, they have sunk bodily into the ties ½ to ⅝ in. These rails have been tilted outward by the crushing of the ties, which accounts for the form of wear. When kept in normal position the heads wear nearly flat across the top. Fig. 26 shows characteristic tangent-wear.

With the idea of easing the passage of wheels, some railroad engineers have advocated cutting the rail-ends to a mitre. This is an objectionable nostrum for an imaginary disease. The effect of weak joints is to develop the ballistic tendency, described on a previous page, fig. B, and the blow is delivered, not at the rail-ends, but some inches beyond. So marked is this action, that on a double-tracked road in the usual state of repair, the direction in which the trains run can be instantly determined by a glance at the joints.

A word in reference to templates. Very few of those furnished by the railroads are accurate. As the average mechanic to whom such work is intrusted has a supreme contempt for sixty-fourths, the inspector not infrequently comes around with a different template from that previously sent to the mill. But a greater mischief is done when templates are made from templates and errors are multiplied. In at least one case, that of a Western road, their pattern actually grew by this process into a new design, for which separate rolls had to be kept; and other instances have only been averted by discovery and negotiation. Each new template should be fitted to an accurate hard-paper drawing, not a tracing or blue-print; and in making the drawing the fishing-angles should be laid off by calculating the triangles and not by protractor. One difficulty in making templates is to get them symmetrical. Their accuracy in this respect should be tested by reversing upon the drawing.

The Forest Hills Disaster.

The hearings before the Massachusetts Commissioners were ended April 4, when George Putnam, counsel for the road, summed up the case from their standpoint.

On April 1 Prof Geo. F. Swain testified that he had examined the bridge, believed the faulty hangers to be the immediate cause of the fall, and that the eccentricity of the loops, together with the poor condition of the iron, caused their breakage. He estimated that the unbroken hangers found by him would sustain not over 25,000 lbs., and that the strain on the broken hangers must have been about 60,000 lbs.; they were not strong enough even when in good condition. E. H. Hewins, builder of the bridge, said the hangers were not die forged, because he could not at that time find suitable dies. E. S. Philbrick, employed by the road to investigate the accident, had looked for evidence of derailment, but found none; agreed with Prof. Swain as to the hangers; and could find no satisfactory solution of the causes of the accident, except that they were at fault; everything connected with it could be explained on the theory that they broke first. The hangers might have broken in the fall if a derailment had thrown down the truss, but the other theory was the more probable one. He thought that with ordinary bridge iron the design of the hangers was at fault. Had they been made of steel it would have been different. He never saw a bridge of this construction where the rails were carried so near the top chord.

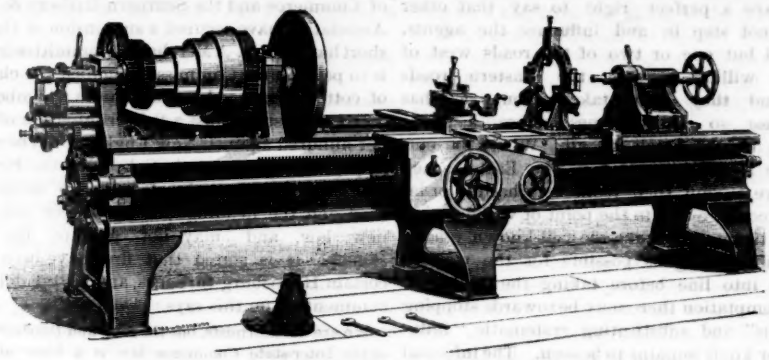
A letter from the New Jersey Steel and Iron Co. of Trenton, N. J., stating that they had no hand in building the bridge, except to afford Mr. Hewins facilities in the way of shop room, tools and labor, and to furnish a portion of the iron, was put in evidence.

Clemens Herschel, of Holyoke, Mass., who was a member of the Board of Commissioners at the time the bridge was officially criticised, and since whose incumbency there has been no civil engineer on the board, has been questioned by the Commissioners, but his testimony will not be made public until the report is made. This will not be for two or three weeks yet.

25-Inch Screw Cutting Lathe.

The accompanying illustration represents a new pattern of 25-in. lathe recently made by the Betts Machine Co., of Wilmington, Del.

This lathe swings 25 in. diameter over the shears, and 16 in. over the rest carriage; the cone pulleys have four speeds



25-inch Screw Cutting Lathe.

Made by the BETTS MACHINE CO., *Wilmington, Del.*

for 3½ in. belt. The lathe is double back geared, giving twelve changes on face plate. The spindles are of hammered cast-steel running in gun metal boxes, and the dead spindle is secured by a conical binder. The spindle has large journal, making it suitable for overhanging work on face-plate.

The rest carriage has a hand movement by a rack cut in the bed, and has a compound movement on it. The feed is either through a train of gearing and the rack in the bed with a suitably arranged friction clutch on the rest carriage, or by the screw and cut cog gearing, at the pleasure of the operator, and it has also an automatic cross feed in either direction, both of which are driven by cone gearing, with three changes, so as to vary the feeds without changing the wheels. The carriage is long and wide and well adapted for securing work to be bored.

The lathe has an extra pair of gears on the back-shaft, giving additional power on speeds suitable for small diameters. The girts in the bed are 24 in. from centre to centre.

Dennis' Safety Appliance for Car Stoves.

A safety appliance for car stoves has been patented by Mr. H. Clay Dennis, of Tyrone, Pa. It consists of a double tubular casing of wrought iron, or steel, about ¼ in. thick, inclosing the stove, constructed to supply the car with a current of pure, heated air, drawn from beneath the car, and passing through registers in the appliance. The openings are so constructed that no conceivable force can destroy their efficiency.

A base of steel plate is securely fastened to the floor, and provided with a cold air grate upon one side, admitting cold air through the bottom of the car, and passing across to the opposite side, and through another or false bottom, supported 1½ in. above the base, thence into the stove and through the space between the stove and the casing. The cold air grate through the base is provided with a covering, to one end of which is fastened a spring, the other end being provided with an arm of thin steel running through the casing and out on the floor of the car, and having holes at proper distances to admit of its being held open by means of a pin in the floor, so that when the grate is open the spring will be at its greatest tension. The tubular casings surrounding the stove are both securely fastened to the base, the outer one being 3 in. larger than the inner one, leaving an air space between them of 1½ in.

The inner casing is provided with a register for the escape of heated air, and is also supplied with a covering, attached to rods on each side, upon which it will move up or down, as required to open or close the register. This covering has an arm attached, running downward and just through the floor, where it is secured with the register open. A flat spring is attached to the steel base, and also to this arm, in such manner that when the register is open, the spring is at its greatest tension. To this fastening is also attached a strong chain, securely fastened to the truck, and left slack, so that ordinary motion of the cars will not disturb its fastenings. Should the car, however, leave the track, the fastening under the floor would give way, and the action of the spring would close the register. Should the stove be overturned, the spring at the cold air grate in the base would immediately close that opening. The outer casing is provided with an open-air register, upon the opposite side, and above the inner one, through which the heated air is distributed to the car.

The openings through the false and main top of the casings, through which the smoke passes, are upon opposite sides of the casing, the lower or inner one being in direct contact with the stove (both being *perforated* openings), with a space of 1½ in. between the two coverings.

Each casing is provided with a door, through which access may be had to the stove within, and is fastened securely by means of double spring bolts. Each door is operated independently, and can only be opened by means of a key. The doors present no projecting parts to be destroyed in case of accident.

It is claimed that this invention provides an economical method of avoiding the danger of fire without altering existing appliances and that the car is heated with a current of pure heated air. It is also claimed that the spring being within the casing no injury to the car could affect the working of the device.

Manufacture of Fibrous Iron.

This invention of Messrs. Alberto de Laude Long, of Yarm-lane, Stockton-on-Tees, proprietor of iron works, and Richard Howson, of Southfield Terrace, Middlesbrough-on-Tees, engineer, consists of a new manufacture of fibrous iron of special and superior quality. They employ as the material basis of such manufacture what is known as mild steel, that is to say, melted steel containing a comparatively low percentage of carbon, and acquiring thereby much of the softness and ductility of wrought iron. Instead of casting such steel into ingots, they cast it in such a way as to obtain it in a comminuted or granulated form. They then heat a mass of granulations so obtained in a furnace with a cinder bottom and ball it up; which being done it only remains to bloom in the same manner as is practiced with ordinary puddled iron, and finally roll it into bars, plates, or other forms of finished iron. It will be noted that, inasmuch as the product thus manufactured really partakes more of the nature of iron than of steel, they have therefore named it "fibrous iron." Nevertheless the term "fibrous mild steel," or "fibrous steel" is not inapplicable to it, because the early stage of the process is in fact that of the manufacture of what is called "cast steel," the hardness or softness of which is determined by the percentage of carbon with which it is allied. It must be understood at the same time that they do not confine themselves to any particular proportion of combined carbon. With regard to the production of the cast steel previous to its granulation, they do not confine themselves to any particular process, but they state that both the Bessemer and the Siemens-Martin processes, with either the acid or the basic mode of treatment, are equally applicable for the supply of good material as the basis of manufacture according to this invention. It will be understood that the hearth of the furnace should be well covered with a melted cinder, slag or glass, the exact composition of which is not material to the invention, provided it is comparatively fusible, and not injurious to the metal. The object of its presence is—1st. That it may cover the metallic grains during the process of heating, and thus protect them from oxidation; and, 2d, that it may intermingle with the granulations, and pervade the interstices of the entire mass when it is balled up. It is in fact this spongy condition of the balled up mass which gives the final product its special quality of fibrousness as distinguished from the homogeneousness of steel when cast in the ingot form. What the inventors claim is:—The manufacture of a superior and special quality of fibrous iron (which may be otherwise called fibrous steel) by first granulating cast steel, and then welding together the granulated material and treating it after the manner of a puddled ball.—*Iron Trade Exchange.*

Crookes' Heat Detecting Paint.

The Mechanical Engineer (Manchester, Eng.) states that this paint is of a red color, and when heated becomes brown: it is hence very suitable as a paint for axle boxes and pedestal bearings generally. The first indication of change appears at about 110°, and at 140° the red paint becomes a dark brown, and this change of color may be brought about a practically unlimited number of times without any signs of the chameleon quality becoming impaired. For bearings it is not a bad plan to paint first with ordinary red paint of exactly the same color, and upon this paint the letters **HOT** in indicator paint. The letters only become visible when the bearing commences to heat. Over all a coat of protecting varnish should be laid. By adopting this plan there will always be an unchanging standard of comparison, so that the first change of color will be easily noticed.

Finlay's Central Support Freight Car.

Several Finlay three-truck freight cars of 50,000 lbs. capacity are running on the Hot Springs Railroad in Arkansas. The centre of the car is supported by a special form of truck having a lateral motion on friction rollers. The ends of the car are supported in the usual manner by ordinary freight car trucks of ordinary pattern.

Mr. L. Finlay, the Master Mechanic of that road, states that these cars have been running since November, 1883, and have been making an average of 900 miles per month, with no renewal of wheels or any repairs except painting. They are often run on passenger trains and have the Westinghouse Automatic brake on the two end trucks. Mr. Finlay claims that the wear of wheel flanges is practically done away with. The load being distributed over three trucks cars of greater capacity can be safely run with the present M. C. B. standard axle, journal box, etc. One 80,000-lb. car on this system has been running for some time, and several 60,000-lb. cars on this system are running in various parts of the country.*

The Inspection of Railroad Bridges.

In the Massachusetts legislature, April 5, the committee on railroads took up the order of Senator Phillips in regard to inspection of railroad bridges. Prof. Vose read a paper in which he said that about 40 bridges fall every year, whose weakness could be discovered by competent inspection. Engineering estimates of the strength of bridges vary from 100 to 140 lbs. per square foot, yet there are bridges near Boston, liable to be heavily crowded, which are built to bear only 10 lbs. per square foot. Chairman Crocker of the railroad commissioners suggested that the matter might well be tabled for three weeks until a decision was reached on the Forrest Hill disaster. The committee tabled the matter, according to Mr. Crocker's suggestion.

Submarine Tunnel in New South Wales.

Two proposals have been submitted to the New South Wales Minister for Works (Mr. Lyne) for the construction of a tunnel under Port Jackson to connect Sydney with North Shore. One by Messrs. O'Neil and Gipps represents a tunnel suitable for both railway and tramway purposes, and a second tunnel for road purposes. The second proposal received is from a submarine tunnel and tube company of New York, who make an offer to lay down a double tubular tunnel for road and railway purposes.

The Bush Rail-joint.

A new rail-joint, the invention of Capt. Thos. Bush, the patentee of the well-known interlocking track bolts, is being tried on the Pennsylvania. The joint has only been in use a few weeks and very satisfactory results are anticipated.

The Burlington Brake Tests.

No less than eight brake companies have announced their intention of entering into the tests, and six state that they have obtained the requisite number of cars. The names of the companies and the means used to actuate their brakes are believed to be as follows:

American (compressed air); Card (electricity); Carpenter (electricity and compressed air); Eames (electricity and vacuum); Hanscom (compressed air); Park (electricity); Rote (buffer); Westinghouse (electricity and compressed air).

Heating Trains by Hot Air.

Messrs. Richards and Pounder, of the Locomotive Department of the New York, Lake Erie & Western, have designed and patented a system for heating passenger trains by means of hot air conveyed the whole length of the train by means of pipes about 3 in. diameter. The Westinghouse air pump is employed to force air through a coil of pipe in the smoke-box and thence through the continuous pipe running the length of the train. Radiators of peculiar construction are placed in each car, and it is claimed that they will retain heat for three or four hours should the engine be detached from the train. In ordinary working the hot air does not pass into the car, but radiates its heat by means of the radiators, and escapes at the end of the train. The connections are made with canvas hose lined with asbestos, and the couplings resemble those used by the Eames vacuum brake.

The system is ingenious and the details appear to have been carefully worked out. The great advantage of the system would appear to be that the pipes and couplings are not liable to be choked with ice, and that the nuisance of escaping steam blowing about the platforms of the cars and freezing on the track would not exist, but it seems probable that some difficulty would be found in getting hose to stand the high temperature. The low specific heat of air renders it an unsuitable vehicle for the transmission of heat, unless it is used in large quantities and at a high temperature, and it is difficult to comply with these conditions in a railroad train.

*Mr. Finlay's central support truck was illustrated in the *Railroad Gazette*, July 11, 1884.

W. C. Baker.

The name of the President of the Baker Heater Co. of New York is not W. *B.* Baker, nor is it W. *G.* Baker. It is always W. *C.* Baker, and the *Railroad Gazette* regrets that it has so persistently been in error about it.

Craven's Draw-Bar.

Some experiments are about to be made on the Boston & Albany with Craven's draw-bar between engine and tender, a engine just built at the Springfield shops being fitted with this device.

The Willing Enamel Signs.

In answer to inquiries, we are authorized to state that Mr. F. A. Marsland, of 84 West Broadway, New York, is the agent in this country for the Willing enameled signs referred to in a recent issue. The signs are made by the Patent Enamel Co. The clear white letters on a deep blue ground render the signs conspicuous objects on the elevated railroad stations.

Designs for Armored Ships.

The competitive designs for two armored ships, advertised for by the Navy Department last August, were opened April 1.

The Bureau of Construction presented designs for both ships. Lieut. Chambers, U. S. Navy; Mr. S. H. Pook, U. S. Naval Constructor; Mr. N. L. Towns, of New York, and Mr. F. L. Norton, of Washington, each presented one design. Designs were also received from the Thames Iron Shipbuilding Co., London; the Barrow Shipbuilding Co., Barrow-in-Furness; Mr. Watt, of Birkenhead; Mr. A. H. Grandjean, of St. Nazaire, France, and Mr. M. S. Clayton, Auckland, New Zealand.

The Open-hearth Steel Industry of the United States and Great Britain.

Secretary Jeans, of the British Iron Trade Association, has published the production of open-hearth steel for 1886, which is 694,150 tons, against 583,918 for 1885, a gain of nearly 19 per cent. In this country the production was 219,291 tons, a gain of 64 per cent.

The production of the two countries in gross tons for the past ten years has been:

	United States.	Great Britain.
1877	22,340	137,000
1878	32,255	175,500
1879	50,259	175,000
1880	100,851	251,000
1881	131,202	338,000
1882	143,341	436,000
1883	110,357	455,500
1884	117,515	475,250
1885	183,376	583,918
1886	219,291	694,150

In 1885, 72 per cent. of the open-hearth steel returned to Mr. Jeans went into plates and angles, which were greatly used in ship building, and 15 per cent. was worked into bars, the greater proportion of which was used in the manufacture of tin plate, open-hearth steel having to a great extent replaced coke and charcoal irons as the basis for tin plates. We do not manufacture tin plates, and in 1886 built very little steel shipping. Between lake shipping and the government orders, the demand for open-hearth steel will be much increased, and new furnaces will be built to supply a part of the government demand.

Magnolia Metal.

Some tests were recently made by Mr. W. D. Dickey, Superintendent of the Erie Basin Dry Docks, Jersey City, upon Magnolia metal, a new material for bearings.

The tests were made on a testing machine of peculiar construction. A small pulley running 2,000 revolutions is mounted on a small spindle with conical end journals. The bearing metal to be tested is forced endways against the conical journals. As will be seen the test is a trying one, the bearing resembling a footstep bearing rather an ordinary cylindrical journal. As is well known, it is exceedingly difficult to keep thrust journals cool, whether conical or stepped. The results obtained by Mr. Dickey were as follows:

Magnolia vs. Hart's Metal—Feb. 18, 1887.

	Rev per min.	Press. Sq. in.	Av. temp.	REMARKS.
Magnolia	2,000	471 lbs.	118° F.	Hart's Metal fused at 480°
Hart's	2,000	471 lbs.	270° F.	and stuck to journal.

Magnolia vs. Parsons' White Brass—Feb. 21, 1887.

Magnolia	2,000	604 lbs.	113° F.	Parson's Metal fused at
Parsons	2,000	604 lbs.	211° F.	255° and clogged journal.

Magnolia vs. Post's Zero Metal—March 21, 1887.

		Lbs.		
Magnolia	2,000	1,000	207° F.	Post's Zero melted out at
Post's Zero	2,000	1,000	241° F.	310° Fah. and clung to journal, while Magnolia was intact, showing 216° temperature Fah.

The temperature given above was indicated by a thermometer inserted in the upper surface of the bearing and was doubtless far lower than that reached by the surfaces in contact. The speed of the rubbing surfaces at the point of the largest diameter of the conical journal was about equal to that of a locomotive driving journal when running about 65 miles per hour.

Mr. Dickey states that the magnolia metal maintained a smooth and brilliant wearing surface throughout the tests. The metal is soft and can be dented with the finger nail. It is dull in color, resembling lead rather than Babbitt metal.

The Power of Modern Artillery.

Gen. H. L. Abbot, in a lecture lately delivered before the Academy of Sciences, New York, stated that the new Armstrong gun of 110 tons, tried only last week, with 850 pounds of powder and an 1,800 pound shot, can pierce all the targets, and has developed 57,000 foot-tons of energy. The obelisk in Central Park weighs 225 tons. If shod on its apex with hard steel, dropped point downward from the height of Trinity steeple, would strike with just about the effect of one of the projectiles from the 110-ton gun. Two of these guns are ready for the ironclad Benbow, and the Italians have several equally powerful 119-ton Krupp guns.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

On another page we give a report on the fall of a bridge over the Big Otter River in Virginia, with illustrations of the structure; also a letter from the contractor. We are informed that the company is making a most careful and thorough investigation of the cause of the accident; and, awaiting the result of that, we make no comment.

The practicability of running freight trains with tight couplings has been often disputed, and much argument has been wasted on a point that could only be solved by actual experiment. The Chicago, Burlington & Quincy, the pioneer in many improvements in railroad working, has been the first to try the common sense plan of running an ordinary freight train with and without slack, the train being worked by the usual crew in the usual manner, and the results carefully noted by competent observers. These experiments, as carried out by Mr. Godfrey W. Rhodes and his staff, have been already referred to in these columns, and show that close couplings diminish the shocks without impairing the starting power of the engine. These results cannot fail to have an important influence on the future type of coupling to be adopted, and will doubtless facilitate the general use of continuous brakes on freight trains.

The approaching freight train brake trials at Burlington, commencing on May 9, will in all probability be of considerable interest. Many entirely new forms of brake will be present, while it is probable that buffer brakes will be conspicuous by their absence. The American Brake Co. will bring a new air brake on the field. The greatest interest, however, will be found in the brakes in which simultaneous application is obtained by electricity, while the power is obtained by compressed air or vacuum. The Westinghouse and Carpenter brake companies will be represented by the former combination and the Eames by the latter.

This is a virtual acknowledgement of the impossibility of obtaining the requisite quickness of action by any other means. It appears, therefore, that electricity will be used by at least five brakes, those of Card, Carpenter, Eames, Park and Westinghouse.

The American and Hunscom brake companies will be represented by air brakes.

The Rote brake, if on the ground, will be the only representative of the buffer brakes, but it is somewhat surprising to see that is highly probable that the majority of the brakes at the tests will make use of electricity. As the trials of each brake will consume about four days, the trials will probably last from four to six weeks.

The action of the trunk lines and other roads east of Chicago and St. Louis on the ticket-commission question seems to be more determined and more heartily unanimous than anything they have before done in the premises. They assume that they are paying their own ticket-sellers salaries for their work, that their salaries are "reasonable and just," and that, therefore, the roads have a perfect right to say that other roads shall not step in and influence the agents. Doubtless all but one or two of the roads west of Chicago are willing to join the Eastern roads in the stand they have taken; but, as has been the case so many times before, a single objector can tie the hands of all. What the outcome will be is still uncertain. The Eastern men naturally have to shut their teeth very hard in order to get their courage up to the point of withdrawing from sale all tickets over old and well-known routes, and are waiting as long as possible for the western men to come into line before taking the final step. How much temptation there may be towards stopping "commissions" and substituting systematic "influence" of other kinds remains to be seen. The informal circulation of five-dollar bills is a resource always at the command of new or small roads, and not out of the reach of larger ones; and the giving of presents in other forms is an effectual device much older than the oldest lobbyist any American railroad ever heard of.

The Spring Time Convention, which meets at the Hotel Brunswick, New York City, next Wednesday seems likely to be as interesting as its predecessor, the discussion of the Code last fall having been watched with interest by a very large number of the active operating officers of the country, so that a larger attendance may be looked for. The committees on uniform car mileage and on the 24 o'clock system will report, and the uniform code committee will present the results of its labors on the telegraph-train-running rules, which were necessarily omitted from the code presented in October because there had not been time to prepare them.

The fact that there are many features on which it is impossible for this or any committee to induce the roads to agree, seems to have somewhat impaired the good effect of the valuable work the committee has done; and uniformity of arrangement and of language and the weeding out of useless and ambiguous matter will perhaps prove to be the most valuable result of the action thus far taken, though even this much is in danger of being thrown away unless superintendents move cautiously. The first step taken in the attempt to harmonize or combine with the new code some discordant feature of an old one, reveals an interdependence of rules and clauses that necessitates the most careful and painstaking inquiry and comparison, and the temptation to leave the work undone or to do it shabbily is great. Managers who have not many changes to make, or who have the boldness and confidence to adopt the new code in all its features at once, will be ready to vote for final adoption at the coming meeting; while those who have many new adaptations to provide for, or who desire to attempt agreement on some of the still unsettled points, probably will be in favor of more discussion and further postponement of final action. Some of the criticisms offered at the October meeting seem likely to come up in a more positive form, and some important roads not then represented will probably take active interest in the proceedings.

The Inter-state Commerce law has gone into effect, and we already begin to see some of the difficulties which must come from an effort to regulate by law the workings of the vast and intricate system of our national commerce. This system, like modern society itself, stands as the result of many forces which have been slowly acting on each other. Into it enter legislation, judicial decisions, compromises between the interests of shippers, carriers, consumers, contending lines, rival sections, competing industries, and, in short, all the elements of our industrial life. Suddenly Congress steps in and "regulates," by one comprehensive act, the growth of years. If the result is not a tremendous disappointment to the friends of the bill we shall be greatly surprised. If it does not cause serious and very injurious derangement of commercial interests we shall be greatly pleased. But whatever the result, the Commissioners have entered now on a task such as few men are ever called upon to undertake. That they will have the honest aid of all but the least responsible of the railroads is very probable. But the roads represent great investments, and they will not be legislated out of fair earnings on their capital if they can help it. Consequently, in the distribution of business, local has to be sacrificed to through, or the reverse, according to special conditions, and in the rearrangement of rates and classification shippers find new causes of complaint.

The Arkwright Club of New England Manufacturers has instructed its Executive Committee to go before the courts and the Inter-state Commission with a complaint against the new rates. The Atlanta Chamber of Commerce and the Southern Railway & Steamship Association have secured a suspension of the long and short haul clause. A Merchants' Committee in New York is to petition the Commission against the classification of cotton piece goods. The Boston Chamber of Commerce protests against a "discrimination of five cents per hundred against New England." The advance of 20 per cent. on quarterly tickets by the Pennsylvania and the withdrawal of mileage books by that road and the Reading are not direct results of the new law, and may not get to the Commissioners. It is stated that fires have been banked in certain Harrisburg furnaces, and a Philadelphia paper commenting on this says:

> We are not alarmists, but the long and the short haul clause of the Inter-state Commerce law is a blow at the leading manufactures of this state almost as hard as the abolition of our foreign tariff.

Minnesota millers are looking for relief by shipping flour by the Mississippi to the Gulf. Englishmen are speculating upon the advantage the Grand Trunk is to derive from the destruction of the pool. Those theatrical managers who take companies out "on the road" are grumbling at paying full fare and extra baggage charges, and predict a lowering of the tone of the stage outside of New York. Probably they too will appeal for protection to this new-found "friend of man." A Dr. Pooler (a suggestive name), of Orange County, New York, thinks the Erie is "hostile" to milk, and threatens to appeal to the Commissioners. These are a few of the perplexities, large and trivial, which have already arisen in the last few days, and they are suggestive.

RAILROAD REGULATION IN ENGLAND AND AMERICA.

It is interesting to compare our Inter-state Commerce law with the Railway and Canal Traffic bill recently introduced into Parliament.

The English bill does not cover all the points of the American law. Some of them have been already settled in England. It has been well established, for instance, that personal discrimination is unlawful under the act of 1854, and the courts and commissioners between them have done a great deal to define it, and even to check it. It has also been established, beyond much chance of controversy, that pools or similar traffic agreements are not in themselves unlawful—the opposite of the position taken by the American law.

There are three main points left for comparison; the constitution of the commission, the means for securing publicity of rates and the treatment of local discrimination.

The English commission has hitherto consisted of three members, one of whom was to be a lawyer and another a man of practical experience in railroad business. It has been much more clearly a court than the American commission, and its findings have had a distinctly judicial character. Under the proposed bill this character will be still more strongly marked. It is provided that the legal member is to be the chief commissioner; and it is further provided that three additional members shall be appointed, one each from among the Superior Court judges of England, Scotland and Ireland respectively. These additional members are not permanent, like the others; each is required to attend to those cases which arise in his own part of the country, but not elsewhere. The jurisdiction of the commission is quite wide: and there is to be no appeal on questions of fact or of *locus standi*—*i. e.*, on the question whether the plaintiff was a person authorized to make the complaint.

Side by side with this commission there is another body which does a great deal of the work which will be thrown upon the shoulders of our American Commissioners. This is the Board of Trade—an organization originally intended to gather information with regard to shipping, but which has for many years past collected most of the statistical and descriptive information which the English government has required with regard to railways. It is on this body that the work of securing publicity of rates will largely fall. Within a year after the passage of the act, every railroad is to submit to the Board of Trade its classification and schedule of rates. This is well enough; but now comes a most radical provision. If the shippers object to the classification or schedule, and cannot come to an understanding with the roads, the Board of Trade may force upon the roads a provisional schedule of their own. This provisional schedule will be discussed by a select committee of Parliament; and the schedule finally adopted by Parliament shall be binding upon the company.

This is like going back to the days of Granger legislation. Fortunately Parliament and the Board of Trade are both rather conservative bodies, so that no

great harm is likely to be done ; but the principle is dangerous.

The section concerning local discrimination reads at follows :

25.—(1.) Whenever it is shown that any railway company charge one trader or class of traders, or any district, lower rates for the same or similar goods, or lower rates for the same or similar services, than they charge to other traders, or classes of traders, or another district, or that in the adjustment of the rates and charges of a railway company there is a difference in the treatment of British goods and foreign goods, or a difference in the treatment of goods founded on the place of origin of the goods, the burden of proving that such lower charge or difference in treatment does not amount to an undue preference shall lie on the railway company.

(2.) In deciding whether a lower charge or difference of treatment does or does not amount to an undue preference, the court having jurisdiction in the matter, or the commissioners, as the case may be, may, so far as they think reasonable, in addition to any other considerations affecting the case, take into consideration whether such lower charge or difference of treatment is necessary for the purpose of securing the traffic in respect of which it is made.

This is, on the whole, considerably better than the corresponding section of the Inter-state Commerce law. It amounts to this: that when an inequality exists of the kind which is prohibited under our short-haul clause, the railway company shall be required to show good cause why such inequality exists. This practically amounts to the same thing as saying, as the American law does, that the Commission shall have power to make exceptions where there is special reason ; and it reaches the result in a better way. The last half of the section, which allows competitive rates, is delightfully explicit. It is, in fact, so explicit as to arouse opposition, which may become serious. The London *Times* has a long editorial on the subject, which probably reflects pretty clearly the average British opinion. In the course of this article it says :

To the unsophisticated mind it must necessarily appear that a low rate is in all cases determined by the necessity of securing the traffic and by nothing else. It seems superfluous, therefore, to require that they should prove this self-evident proposition in a court of justice. Rather they ought to be required to prove that the higher rate is necessary to secure the traffic, and this is a very different matter. They are secure of the native traffic in any case. Why is it to pay more than they can afford to carry the foreign traffic for ?

The underlying idea of the *Times* is that all rates could probably be leveled down to the scale of the competitive rates. In short, the English public to-day probably understands these matters no better than the American public did fifteen years ago. Grant the correctness of the ideas of the London *Times*, and you justify the Granger legislation. It was the practical failure of that system which taught people that the underlying idea could not be correct. The high rates were justified, not, as the *Times* sarcastically suggests, by the necessity to the railroads of securing the local traffic, but by the necessity to the local traffic of securing the railroad service.

Whether England will insist on learning the lesson by disastrous experience remains to be seen. But it is clear that she has not yet learned it. In some respects English railroad law is a great deal better than our own ; but the general question of the relation between the companies and the public is even farther from any satisfactory solution in England than in America. Certain detailed abuses have been done away with, but the English railroad managers have yet to learn that they have obligations to the public as well as to the stockholders, and the English public has yet to learn that if it ignores the special exigencies of railroad business, it does so at its own peril.

THE BEST SIZE OF FREIGHT CAR.

Few essential features about the railroads of the world present such wide divergencies of practice as the size of freight cars. While it has been found inadvisable to depart from the standard gauge by even a few inches, cars differing in capacity several hundred per cent. are running under what appear to be very similar circumstances. Is there any general law by which the size of freight cars is determined, or is it a result of mere accidental circumstances?

It is very generally believed that the old discussion as to the best size of freight car cannot be settled by any appeal to general principles, but depends on the circumstances of the particular railroad or kind of traffic in question. This, however, is but part of the truth, and a little reflection will show that, there is a general law which apparently does determine the size of freight cars.

It is obvious that if certain cars can be confined to a certain kind of traffic on one railroad, they can be made to suit that traffic and that traffic only. Such cases seldom arise except in the case of coal cars running on a line from the mines to the port of shipment It is generally difficult to obtain return loads for such cars, and consequently they are made suitable for the conveyance of coal and nothing else. As loading, unloading and shifting cars are important items in the expense of handling coal, the cars must be conveniently handled at terminal points as well as on the road. Hence it is quite frequent to find coal cars differing considerably in size, construction and proportion from freight cars, and even coal cars on other roads.

Freight cars on the other hand are generally very similar on all roads interchanging traffic, the differences being chiefly in details, which, though similar in principle, are sufficiently dissimilar in dimensions to prevent any interchange of parts.

The reasons for this general similarity are not very far to seek. Freight cars are interchanged, and every freight car in good condition practically circulates all over the country, and is working under the same conditions as every other freight car. It is, therefore, obviously almost a necessity that every freight car should be of generally the same construction and capacity.

A case in point will illustrate this. Recently the A B road were about to convey some freight from X, a point 25 miles away on a neighboring line, to Z, a point 800 miles down the A B line. The latter road sent some empty 14-ton cars for the purpose of loading the freight, but the C D line refused to haul these cars over only 25 miles of their road, saying that they would handle nothing less than 20-ton cars. The A B road were, consequently, made to feel that their 14-ton cars were somewhat useless.

This incident shows the strong tendency to enforce the law that all freight cars shall be of uniform size, for a 60,000-lb. car is but a 40,000-lb. car of the same cubic contents, but with stronger running gear and framing. A different state of things exists as regards coal cars. As coal cars are not so widely interchanged, each district or coal-carrying railroad employs the class of car which suits best its own particular grade of coal, general circumstances and length of haul. In one district small four-wheel cars are universal, in another 50,000-lb. cars are the standard, while the dump bottoms general in one state are never found in another.

The largest cars will generally be found where the hauls are longest, and the smallest cars where the hauls are shortest. This is generally true of the coal traffic in this country, and an instance may be found on the Lehigh Valley, where the small four-wheel cars are employed on the short haul on the portion of the road running from the Allegheny divide to the Atlantic, while the trains on the long haul running to Buffalo are almost entirely composed of large eight-wheeled cars.

As regards freight cars, the comparison may be made to embrace the world. The longest average haul of any country, 115 miles, is found in the United States,* and the largest cars are also found here. The shortest average haul is, in all probability, in Great Britain,† for though the distance is not known, and has been guessed at from 40 miles to 60 miles for merchandse, and 20 miles to 35 miles for minerals, the charge per ton of freight conveyed (72 cents) is the lowest of any country, though it is evident that the charge per ton per mile is high. Concurrently with the shortest average haul, the English railways use the smallest cars, "wagons" rarely exceeding 20,000 lbs. capacity. Nor has the size been increased of late years, cars being made stronger and heavier to resist blows in switching rather than larger to carry increased loads.

The average length of haul on the Continent of Europe is about 59 miles, undoubtedly greater than in England, but shorter than in this country. The freight cars on the Continent are larger than in England and smaller than here, the Russian and German cars being larger than those used in France. The average length of haul in Austria is 64 miles, Germany 51 miles, and 70 miles in France. The length of haul has therefore a very obvious influence in determining the size of freight cars. This arises from the fact that a small car is most easily handled at terminal stations, while a large car is most economically hauled in proportion to the load carried.

The cost of handling traffic may be divided under two broad and entirely distinct headings. The terminal charges may include cost of loading and unloading, switching, and interest on cost of terminal facilities, etc. The haulage charges commence when the car leaves the yard, and continue till it arrives at the other terminus of its journey.

It is obviously the best policy to make a car which will convey the load for the least possible cost. If the cost of haulage is far more important than the terminal charges, the most economical car will obviously be that which is especially designed for running in a train. Such a car, though, perhaps, necessarily awkward to load and unload and shift in a yard, will be on a long haul more economical than a car which is expressly designed with a view to facilitate the terminal work, and is, therefore, unavoidably less adapted for haulage than the other car.

An example will make this clear. Taking two cars A and B, we will assume that in A one ton can be *hauled* for 0.5 cent per mile and that the terminal charges will be equal to $1.00 per ton. With car B the cost of haulage will be 1 cent per ton per mile, but the terminal charge will be only 50 cents per ton of load. The relative total cost of conveying one ton of freight will then be as shown below :

Length of haul.		Cost of haulage.	Terminals.	Total.
10 miles	A	$ .05	$1.00	$1.05
	B	.10	.50	.60
20 miles	A	.10	1.00	1.10
	B	.20	.50	.70
50 miles	A	.25	1.00	1.25
	B	.50	.50	1.00
100 miles	A	.50	1 00	1.50
	B	1.00	.50	1.50
500 miles	A	2.50	1.00	3.50
	B	5.00	.50	5.50
1,000 miles	A	5.00	1.00	6.00
	B	10.00	.50	10.50
2,000 miles	A	10.00	1.00	11 00
	B	20.00	.50	20.50

Some persons may doubt whether any such difference in cost is possible, but a little reflection will show that the wide differences between American and European rolling stock are sufficient to show extraordinary differences in the cost of haulage. An American box car weighing say 22,000 lbs. will convey 40,000 lbs. of grain, making a total weight of 62,000 lbs. A train of thirty of these cars will weigh, therefore, 1,860,000 lbs. Allowing 80,000 lbs. for the engine, 60,000 lbs. for the tender, and 20,000 lbs. for the caboose, the total weight of the whole train will be 2,020,000 lbs. The paying load, the grain, weighs 1,200,000 lbs., or almost exactly 60 per cent. of the gross weight of the train.

Let us now examine a similar English train. The grain will be loaded in open four-wheeled cars, each weighing about 12,000 lbs., and capable of conveying about 10,000 lbs of grain in bags, protected by a tarpaulin. In order to facilitate switching and side-tracking the train is limited to 45 wagons and a caboose, and the two trains compare as follows :

	American. Lbs.	English. Lbs.
Paying load	1,200,000	450.000
Dead load, cars, engine and caboose	820,000	730.000
Total weight	2,020,000	1,180,000

We may now endeavor to ascertain the relative cost of haulage by two or more distinct methods. In the first place the extreme assumption may be made that the cost of running a freight train one mile is constant whatever the weight or length of the train. This assumption has a certain degree of truth, and is the very foundation of the fact that heavy freight trains pay. If the cost varied exactly as the weight it would evidently cost as much to run two 500-ton trains as to run one 1,000-ton train. But experience in this country has shown that this is not the case, and therefore we run heavy trains. Assuming then that it costs $1 to run a freight train one mile, the cost of conveying one ton of grain by our assumed American train is 0.17 cent per mile, while on the European train it costs 0.44 cent per ton per mile.

Let us now endeavor to ascertain the cost of haulage on a totally different hypothesis, viz., that the cost of running a train varies as the gross weight of the train. The average gross weight of the two trains is 1,600,000 lbs. Assuming that the cost of hauling such a train is, as before assumed, $1 per mile, the American train will cost a little over $1.25 per mile, while the European train will cost slightly under 75 cents per mile. The result will then be as under :

Cost of haulage per ton-mile, assuming:	American. Cents.	European. Cents.
1. Cost per train-mile constant	0.17	0.44
2. Cost per ton gross weight of train constant.	0.21	0.30
Average	0.19	0.37

Anything like absolute proof of the difference in cost between the two methods of running trains is of course impossible, but the foregoing shows pretty conclusively that it is possible for a very material difference to exist in the cost of hauling one ton one mile even where all considerations as regards rate of cost of wages, coal, steel rails and other important materials are eliminated.

It may be broadly asserted that the form of freight car is a very important factor in making this great difference of cost. Other elements, of course, have a

* Statistics show that the length of haul in Russia is slighly greater than in this country, but that is probably caused by the greater number of railroad companies here apparently increasing the tonnage, for if a ton of freight goes over two railroads, it is reported twice.

† The charge per ton and the length of haul are smaller in Belgium and Luxembourg, but the exceptionally small size of these countries justifies their omission from this comparison.

considerable influence, but the practice of carrying loads in lots of 20 tons or more, instead of in lots of 5 tons or less, is the essential point which makes the large car the more economical carrier for long distances. In short hauls, as previously shown, the cost of loading and unloading, etc., becomes the more important factor in the total cost of conveyance.

The difference in cost of handling at terminals is undoubtedly in favor of the smaller car, but this difference cannot be shown by reference to a general case, and a consideration of the numerous details involved would occupy too much space at present. Such a difference does exist, and is well known to those who, like our China correspondent, have evidently studied the question on both sides of the Atlantic and endeavored to arrive at the relative merits of large and small cars.

As pointed out previously in this article, a short car cheaply handled at termini will on a short haul convey freight more cheaply than a large car. On a long haul the terminal charges have little influence on the total cost, and the car that carries the greatest load appears to be the cheapest.

More About Bridge Testing.

The following paragraph appears in the daily papers:

BOSTON, March 30.—The Old Colony Railroad officials have just finished a test of the 46 bridges on the Northern Division of their line, including the "High Bridge" at Clinton. This bridge is 70 ft. high, and the span is 149 ft. Two engines, each weighing 130 (*sic*) tons, were run over the structure at a speed of 25 miles per hour, and the deflection was found to be less than ¾ in. The other bridges were found equally safe.

Such a test may satisfy the public and give to those who ride over the road some apparent ground for confidence; but if the test is taken by the officers as final and conclusive, and is not followed up by minute expert examination, they will not have done their duty by their stock-holders, the public or themselves. In fact, such a test alone may be worse than useless, in that it may give a false sense of security. It proves that the bridge does not fall under the test load, and that, without an injury to some part, it is not *likely* to fall under any subsequent lighter load. It proves that, *so long as everything is intact*, the bridge actually has a certain stiffness, and that so far the structure is correctly designed. But it does not by any means prove that everything remains intact after the test load has passed, and this is just the point of the whole matter. A member cracked by the test load, a part so covered that it is steadily rusting away, any one of many other defects in detail would not have affected the deflection of the "High Bridge" at Clinton under the test applied, but may lead to its fall some day, under a lighter load. It is precisely these things that thorough, minute and repeated examinations, and nothing else, will detect. The Bussey bridge *might* have endured a pretty severe test-load within a short time of its fall, without showing alarming deflection. Or it might have fallen under the test, and so saved the lives of passengers. But smashing two or three locomotives, and perhaps killing an engineman and fireman, or two, would have been a prety expensive way of finding out its weakness.

The test-load device has its public uses, but it should not quiet the minds of executive officers or of directors for a moment; they certainly ought to appreciate its limitations. Practically all that can be learned from the test-load can be learned sitting in an office without risking any injury to the bridge. In fact, the knowledge of what materials can do, and of the forms in which they must be put to get their work out of them is so complete, that much can be learned in the office that cannot be learned by testing under a load, as, for instance, whether the bridge is of correct theoretical design and what tests were applied to the material that went into it. But what cannot be learned in the office or anywhere else than on the bridge itself is what has happened to it in service.

Now the business reasons for public tests are obvious; but it is folly for superior officers and directors to allow themselves to be beguiled by them into a feeling of security. On them the final responsibility must come. If their subordinates are derelict or incompetent, it does not shift the responsibility. It is their busines to know that they have proper officers, and that their duties are done. Stockholders and the public must look in the end to them; and to them the grave lessons of the past should teach that the only way to have safe bridges is resolutely and persistently to insist upon *knowing* the bottom facts. And so we come back to the statement that they can know these facts only from the reports of qualified examiners; that they are not revealed by running trains over the structure.

The Union Pacific System.

The Union Pacific Railway, with its auxiliary lines, has a length now of 4,594 miles, and obtains directly a large portion of the traffic of the states of Kansas, Nebraska and Colorado, and of the territories of Wyoming, Utah and Idaho, and indirectly of the Pacific states and Montana.

On account of its large indebtedness to the National Government for bonds advanced to aid in its construction, and which are now nearly due, and because of the various bills introduced into Congress with the view of extending the time for their payment, any information of its present condition and future prospects is of particular interest. The amount of these bonds is stated by the company at $33,539,512, and the interest which had been paid by the government but which the road had failed to make good amounted on Dec. 31, 1886, to $15,670,753, making a total in debtedness on this account of $49,210,265. It should, however, be remembered in considering this matter that the above amount was advanced the company in installments, as the line was building from 1862 to 1869 in a currency greatly depreciated, while payment will be required in currency at par, and that meanwhile the high rate of interest of six per cent. per annum has been exacted.

For the year ended Dec. 31, 1886, the balance sheet shows the assets to be $230,030,959, including $18,599,518 on account of the land department, and the liabilities to be $192,806,385, leaving as a surplus to the credit of the various income accounts of $37,224,573. The road, however, having been constructed when prices for labor and material were exceedingly high and remaining on the balance sheet at cost, there is but little doubt, that if present valuations were placed thereon, this surplus would vanish.

The floating debt, which was stated in the previous year at $1,861,445, is entirely wiped out, and there is an increase in the net assets of $3,751,450. The income from all sources increased $5,113,522, and the interest due the government, $503,539. On Aug. 24, 1886, the last outstanding note of the company was paid and the bills payable account closed.

The item of $1,351,190, appearing in the assets as balance of cash and cash resources, is arrived at by deducting current liabilities, consisting of accounts payable, vouchers and pay rolls, dividends, coupons, etc., amounting to $5,715,134, from current assets, consisting of cash, company's stock and bonds, and bills and accounts receivable amounting to $7,066,324. The bills and accounts receivable, however, are largely on account of advances to branch lines, which are never considered available, hence it would have been better had the items appeared on the balance sheet in their respective places.

The net proceeds for the year on account of the Union Pacific lands were $931,292, and the cash receipts on outstanding contracts and current business were $2,305,353; and on account of the Kansas Pacific land, the net proceeds were $1,257,648, and the cash receipts $1,245,219.

The increase in the earnings compared with the preceding year on the Union Pacific proper was 2 per cent., while the increase in operating expenses was 13.1 per cent., thus causing a decrease in the net earnings of 8.7 per cent., or including taxes of 10.4 per cent. There was an extraordinary increase in the latter of 22 per cent. The auxiliary lines show an increase in earnings of 7 per cent., in operating expenses of 5.2 per cent., in net earnings of 13.7 per cent., or including taxes 14.7 per cent., the latter increasing 10.5 per cent. On the whole system the increase in earnings was 3.6 per cent., in operating expenses 9.7 per cent., in net earnings the decrease was 5.1 per cent., or including taxes 7.1 per cent. Since the mileage for all practical purposes was substantially the same, it appears that while the auxiliary lines averaged a fair increase in earnings, the main line fell off sufficiently, combined with the large increase in operating expenses, to make a decrease in the net earnings of the whole system, including taxes, of 7.1 per cent.

The cause which produced the decrease in the earnings of the main line during what may be termed a prosperous year for railroads, was the dissolution of the pool with the Pacific Mail Steamship Co., which took place Feb. 20, 1886, whereby, through competition for the Pacific coast business, the rate per ton per mile was reduced from 1.06 cents to .58 cent, a decrease of .48 cent or, 45.28 per cent., which, notwithstanding an increase of 34.98 per cent. in the traffic, caused a reduction in the earnings from that source of $463,278, or 25.77 per cent. The low rates on this traffic affected the whole through business, which showed a decrease of $329,886, or 6.64 per cent.; while the local business showed an increase of $1,277,423, or 7.13 per cent. The government was also affected, for under the Thurman act, the road was required to pay 25 per cent. of the net earnings, which were so reduced that the amount due was only $808,033, as against $1,184,053 in 1885. It looks in this case as if it would have been wise for the government to countenance the pool in question.

The increase in operating expenses was caused by renewals and improvements in maintenance of way and maintenance of cars, which on the entire system showed an increase in the former of 23.68 per cent. and in the latter 19.41 per cent., these large increases being necessary, no doubt, because the road and equipment had not been kept up to the standard during previous years.

The total tons carried one mile were 1,269,500,133, an increase of 159,917,731 over 1885, or 14.41 per cent.; and had the rates been maintained the freight earnings would have increased in like proportion, but they decreased from 1.623 cents per ton-mile in 1885 to 1.464 cents in 1886, thus reducing the increase in earnings to 3.25 per cent. The tons carried one mile east and west, both local and through, were so near each other in amount, that empty car mileage must have been small.

The passengers carried one mile on the whole system were 248,523,010, an increase over 1885 of 32.03 per cent., but the earnings did not increase proportionately, because the rate per passenger per mile was reduced from 3.058 cents in 1885 to 2.453 cents in 1886, or 19.78 per cent., the increase in fact being only 5.92 per cent. This decrease in rates was caused by new lines being constructed in territory heretofore served by this system solely.

The traffic of the road, both passenger and freight, is not large considering its great mileage, but is increasing rapidly; the percentage of operating expenses to earnings (62.22 excluding taxes and 66.19 including taxes) is about the same as many other lines; the operating expenses per mile of road, $3,639.54, are quite small; the conditions of the traffic are favorable to economy of movement; the rates taken as a whole are good, and the country new and growing. It follows, therefore, that if a reasonable arrangement can be made in relation to the government debt, and if the present able management remains in charge, a bright future is before the company.

It is worthy of note that during the thirty months the present management has been in office $16,200,000 have been expended in improvements and construction and in reducing the floating debt. The reduction in the latter amounts to $8,251,368, while the increase in the funded debt has only been $323,933.

The report itself is one of the most exhaustive ever published by the company.

Crops of 1886.

From the March report of the Department of Agriculture it appears that the wheat in the farmers' hands March 1 was 26 7 per cent. of last year's crop, which is slightly less than the average remaining at that date; but the absolute amount is 15,000,000 more than last year at the same time, while the commercial stock or visible supply is 57,000,000 bushels, against 52,000,000 bushels last March. The total of these two stocks remaining is 179,000,000 bushels.

The weight per bushel of the crop of 1886 is 58.4 lbs., against 57 lbs. for 1885, and 58.3 lbs. for 1884. The average export price for 10 years preceding 1884-85 was $1.17 per bushel; for 1884-85 it was 86c., and for 1885-86 it was 87c.

The 1886 crop of the world, partly estimated, is as follows:

Countries.	Bushels.	Countries.	Bushels.
America:		Europe—cont'd.	
United States	457,218,000	Roumania	22,679,063
Canada	37,219,234	Russia (including Poland)	213,907,084
Argentine Republic and Chili	28,800,625	Servia	4,525,813
Europe:		Spain	131 660,000
Austria-Hungary	143,001,488	Sweden and Norway	2 468 625
Belgium	18,514,688	Switzerland	1,645,750
Denmark	4,731,531	Turkey	41,143,750
France	299 107,620	Australasia	22,258,146
Germany	82,000,000	India	258,317,632
Great Britain and Ireland	65,285,353	Egypt	16 467,500
Greece	4,937,250	Algeria	32,915,000
Italy	129,412 133		
Netherlands	4,937,250	Total	2,051,322,285
Portugal	8,228.750		

The corn crop of 1886 was less than the average in yield per acre, but owing to the large acreage—larger than ever before planted—has only been exceeded in volume in the years 1879, '80, '84 and '85. The March surplus in the farmers' hands is 36.2 per cent. of the whole crop, against nearly 40 per cent. last year; that is, it is 603,000,000 bushels, against 773,000,000 bushels in 1886 and 675,000,000 in 1885. Taking the seven states, Ohio, Indiana, Illinois, Iowa, Missouri, Kansas and Nebraska, the quantity remaining March 1 was found to be 344,000,000 bushels, or 137,000,000 bushels less than last year, and 34,000,000 less than the average for five years.

The value of the crop on the basis of March prices is put at $614,468,096. The average export price for nine years to include 1885 was 58c.; and for 1886 it was 49.8c, Only in 1879 was it as low or nearly as low. Then it was 47.1c.

Laird, of Birkenhead, the builder of the Alabama, is about to construct a steel steamer for the Inman & International line between New York and Liverpool. The new steamer will be slightly larger than the Etruria, City of Rome or the Servia, for, though not so long as the two latter vessels, she will have 10 ft. more beam, and 5 ft. more beam than the Etruria. Her principal dimensions are given as under: Length, 500 ft.; beam, 62 ft.; depth of hold, 43 ft.; gross registered tonnage, 8,500 tons.

The disposition to increase the beam of fast ocean steamers has become very marked of late years and is the result of the investigations made by the late W. Froude, who showed that the resistance depended more upon the area of the wetted surface than upon the area of the midship section. The proportion of 1 beam to 10½ lengths generally adopted a few years ago, becomes in the new steamer 1 beam to 8 lengths, giving for the same displacement a larger midship section but a smaller wetted surface.

The great beam will doubtless render the ship very roomy, and permits twin screws, and longitudinal bulkheads to be employed for the first time in a fast steamer. Triple expansion engines, indicating in all 17,000 horse-power, are calculated to drive the vessel across the Atlantic in less time than the fastest passage yet made, 6 days 5 hours from Sandy Hook to Queenstown.

It is to be hoped that advantage will at last be taken of the Milford Haven route, avoiding the delay at Queenstown and the inconvenience of waiting for the tide over the bar at Liverpool. Were the new steamer to run alongside the pontoon at Milford Haven, passengers could step from the ship into the train, and be in their hotel in London within seven days after leaving New York. A steamer leaving a pier in the North River at 4 p. m. on Saturday afternoon, the latest hour for

sailing, is across the bar about 7 p. m., and under the present system arrives at Queenstown early on Saturday morning, and the passengers are landed at Liverpool on Sunday morning, reaching London by special train some time on Sunday afternoon. A steamer of similar speed would be alongside the railroad station at Milford Haven at noon on Saturday, and the passengers would arrive in London in time for dinner that evening, the gain in time being about 20 hours.

The adoption of the Long Island route on the return voyage would imply an equivalent gain on this side, the time consumed in waiting for high water on the bar being saved.

Messrs. Vickers, Sons & Co., finding their £100 shares selling at 200, propose to double their nominal capital. According to the *Iron Trade Exchange*, the original proprietors of this successfully conducted company have had a very pleasant experience. The original capital of £350,000 was increased to £500,000, each stockholder receiving one share for every three held. The capital was then increased to its present amount, £750,000, or one share given for every two held, and now it is proposed to double the holdings. How long this practice is expected to continue is not stated, but as they were apparently paying 14 per cent. on their capital of £750,000, it possibly has not ended.

More than quadrupling one's capital should be satisfactory, but this does not compare with the success of the Bessemer works at Sheffield, where, according to Jeans' report as secretary of the British Iron Trade Association, for 1879, "on the expiration of the 14 years term of partnership of this firm, the works, which had been greatly increased from time to time entirely out of revenues, were sold by private contract for exactly twenty-four times the amount of the whole subscribed capital, notwithstanding that the firm had divided in profits during the partnership a sum equal to fifty-seven times the capital, so that by the mere commercial working of a process, apart from the patent, each of the five partners retired, after 14 years, with eighty-one times the amount of his subscribed capital, or an average of nearly cent per cent. every two months—a result probably unprecedented in the annals of commerce," and it may be added it is a result not often attained in speculation. Bessemer himself received for royalties £1,057,000.

Doubt is expressed by Mr. Mattes, in his paper on Rail Sections, published in another column, of the "entire accuracy" of the drawing of the Lehigh Valley flange-worn rail published on page 110 of the *Railroad Gazette* for Feb 18, and reproduced on a smaller scale this week. Most draftsmen have learned that drawing a rail section is "not so easy as it seems to be." Mr. Forney—nearly if not quite the most expert critic of mechanical drawing—used to consider it one of the severest tests of a draftsman's skill. A piece of the rail referred to was delivered at this office by Mr. Sayre, and its reproduction was made a matter of especial care by an experienced and accurate draftsman. The section was afterward compared by several persons both with the drawing and the engraving, and its accuracy is beyond question.

The *Practical Engineer* is the appropriate title of a new weekly paper published in Manchester, the great centre of English mechanical engineering. The paper is illustrated and contains much interesting matter, while the price is unprecedentedly low, being only one penny, or two cents a copy.

It is announced that Prof. A. T. Hadley will deliver a series of four lectures at Harvard on "Problems of Railroad Administration," April 13, 20, and 27 and May 4. Prof. Hadley has studied the subject deeply, and with knowledge and judgment combines, a remarkable faculty of exposition.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines in 1887 is given in the current number of the *Railroad Gazette* as follows:

Fort Worth & Rio Grande, from Fort Worth, Tex., to Mustang, 18 miles.

Georgia Pacific, between Columbus and Starkville, Miss., 30 miles.

Maricopa & Phœnix, from Maricopa, Ariz., to the Gila River, 10 miles.

San Pablo & Tulare, from Tracy, Cal., southeast, 17 miles.

This is a total of 75 miles for the week, making 739 miles reported thus far for the current year. The new track reported to the corresponding date for 16 years has been:

Miles.	Miles.	Miles.	Miles.
1887.....739	1883.....852	1879.....326	1875.....183
1886.....406	1882.....1,545	1878.....358	1874.....303
1885.....255	1881.....778	1877.....232	1873.....535
1884.....437	1880.....1,064	1876.....308	1872.....778

This statement covers *main track only*, second or other additional tracks and sidings not being counted.

NEW PUBLICATIONS.

Leveling and Its General Application. By Thomas Holloway. C. & F. N. Spon, London, and 35 Murray street, New York. 1887. 8½" × 5½". Pp. xi. and 147. Price $2.

This little work treats of leveling with the dumpy level, the omnimeter and the theodolite. There is a strong prejudice against the dumpy level in this country, which we have always thought due more to the inconvenient legs that accompany it than to the inconvenience of an inverting instrument. It is compact, of higher power than a Y level and cheaper. It is more inconvenient to adjust, but keeps its adjustment full as long as its American competitor, if not longer. The omnimeter is theoretically a very convenient and complete instrument, but its weight and high cost have hindered its introduction, except, we believe, in India, where no engineer carries his instrument. What is said of leveling with the theodolite is applicable to leveling with a transit provided with a vertical circle.

The author's remarks on the curvature of the earth and refraction are as clear as any we have ever seen, and his system of keeping field notes, without a column for the height of instrument, will probably not be adopted in this country. It may be doubted if profile paper is used or known of by Mr. Holloway, and the following directions: "You may very much assist the foreman by pushing a piece of folded writing paper, with the number of the stake written upon it with soft pencil, into the ground close to the stake," lead to a doubt as to what he knows about stakes.

"Bruff, who is a good authority upon leveling," is given as an authority for the well-known method of reciprocal leveling for crossing streams, etc.; this method has been in practice here for at least thirty years and requires no indorsement.

THE SCRAP HEAP.

The Biggest Job of the Season.

Nothing in railroad building heretofore in the Northwest has approached the rapidity and army-like system with which the St. Paul, Minneapolis & Manitoba company is sending forward material for the construction of the Montana line. For the past three months there have gone through Devil's Lake, Dak., daily, on an average, 175 cars laden with all sorts of construction material. At Minot, the present terminus of the track, 137 miles west of Devil's Lake, the company has laid something like 10 miles of sidings to receive this material, and along both sides are piled great quantities of ties, bridge material, piling and thousands of the best quality of steel rails. Said an old railroad contractor, after visiting Minot: "It is worth a day's travel to see these mountains of costly material." And still it goes forward in increasing quantities. For the past 24 hours the trains have averaged one in every two hours. And it is estimated that it will require 200 cars daily the entire summer of this material to be sent forward that there may be no delay in the building of this great line of road. All engines do not wait at the terminus for the unloading of trains, but hasten back for more cars, and it is not an uncommon sight to see ten locomotives on their return, with a single caboose attached to each, speeding along the track only a few hundred yards apart. In all this gigantic work there is no confusion, not an accident of any kind has occurred, all material is separated and placed where it can be reloaded and handled at the minimum cost. The roadbed for a hundred miles west of Minot is ready for the rails, and all bridges (one of which is 1,800 feet long) and watertanks are completed for a distance of thirty-five miles beyond that point. Tracklaying will begin in a few days, and grading as soon as the frost is out of the ground sufficiently for that work. Several engineer corps are already in the field many miles in advance of last year's work making ready for the army of over 15,000 graders that will soon follow.—*St. Paul Pioneer Press.*

Winter on the New Brunswick Railroad.

We quote the following from a letter written by Mr. G. A. Haggerty from McAdam Junction, N. B., under the date of April 2. Mr. Haggerty is the Mechanical Superintendent of the New Brunswick Railway:

"Our winter here has been the most severe ever known; the lines of this company in the north have been constantly blocked all winter, and we have had many broken engines and cars. Business has been very light, as the country roads have been impassable. Lumbermen who took valuable horses into the woods in December are unable to get them out; their feed has given out, and they can neither get the horses home nor get feed to them, as the snow is 7 ft. deep, and dangerous for even man to penetrate. For miles the snow is above the tops of the passenger coaches, and engines are constantly stalled. When they come out the snow is heaped all over them, often filling them solid from cab to headlight and resting on the running boards in immense drifts. There are drifts 25 ft. deep, and as I write you we are having a terrific storm. It costs money here to do business in winter."

This is indeed a cold picture. But the hardships of winter would appear to have been lightened as far as possible. Mr. Haggerty has sent a very pretty engraved programme of an entertainment tendered by the railroad company to its employés. It is a lecture on New Brunswick scenery illustrated by dissolving views, and is number 9 in a series that is now in progress.

Turn About is Fair Play.

The Inter-state Commerce bill compels us to adopt a schedule of railroad advertising rates which we beg to announce as follows:

1. For the setting forth of the virtues (actual or alleged) of president, general managers or directors, $2 per line for first insertion and $1 for each subsequent insertion.

2. For puffs expressed in choice English, with occasional French phrases or poetical extracts (the whole with a palpable motive of honest enthusiasm), $2.50 per line; 50 per cent. reduction on each subsequent insertion.

3. General passenger agents and division superintendents will be accorded half rates on the terms offered in rule No. 1. But in all cases where the title of colonel is used regular first-class rates will be demanded.

4. Thousand-mile tickets on the basis of 2 cents per mile will be received in exchange for advertising done at our card rates, but these tickets must hold good on passenger as well as on freight trains.

5. No deviation from the card rates can be made in favor of parties handing us 5-cent cigars with the puffs they desire published.

6. For complimentary notices of the wives and children of railroad officials we demand $1.50 per line. We have on hand, ready for immediate use, a splendid assortment of this literature.

7. Poetry will be made to order at $3 per inch, agate measure. We are prepared to supply a fine line of heptameter puffs, also a limited number of sonnets and triolets, in exchange for 1,000-mile tickets. Epic poems, containing descriptions of scenery, dining-cars, etc., will be published at special rates.

8. General superintendents sending requests for the suppression of news must accompany their requests with $10 bills—not necessarily for publication, but as a guarantee of good faith.—*Chicago News.*

A Long Haul, Because it is Far Fetched.

The Inter-state Commerce bill is clearly a subject of prophecy. Anticipating by about 2,500 years the rumpus which the abolition of the free-pass system would raise, the prophet Jeremiah declared: "Though they roar, yet can they not pass."—*N. Y. Herald.* But in Genesis, eighteenth chapter and fifth verse, we read: "Comfort ye your hearts; after that ye shall pass on."—*Boston Commercial Bulletin.* Can't the scalpers and commission absorbers be included in this last reassuring paragraph? Their ruin has frequently been predicted within the last 2,500 years, but just at present they are anxiously looking for the *Profit* who will prophesy their restoration. Ten thousand dollars premium will be cheerfully paid for a copy of the Scriptures containing authentic consolation on this point.

Shot.

ALBUQUERQUE, N. M., April 5.—The Sheriff's posse that is in pursuit of Bello and John Brown, the notorious desperadoes implicated in wrecking an Atlantic & Pacific train near Blue Water in January last, came upon them yesterday near Lajoya. A summons to halt was answered by a shot from Bello Brown's revolver. An officer returned the fire, and Bello tumbled from his saddle dead. John threw up his hands and surrendered. He will be taken to Socorro County, under charges of murder and horse stealing. Bello Brown is the second of the gang of train wreckers who has been killed by officers. Three are in jail awaiting trial. This breaks up one of the worst gangs of robbers which ever infested New Mexico.

Sued.

Adam Forepaugh, the circus manager, has sued the Maine Central Railroad Co., at Boston, for $30,000 damages, caused by the derailing of a train which was carrying the animals and belongings of the plaintiff's circus from Augusta to Waterville, Me. The defendant had agreed to carry the plaintiff's circus on its line through Maine, and the accident, which occurred on July 16, 1886, resulted in the killing of 87 horses and damage to other property.

Disgusted.

John Ruskin calls railroads "the loathsomest form of devilry now extant, carriages of damned souls on the ridges of their own graves." John must have had his free pass taken up by the conductor when he was several hundred miles from home.—*Norristown Herald.*

Everything Brand New.

The Inter-state Commerce Commission has selected for its permanent quarters the fifth floor in a new and handsome building in Washington, owned by the *Sun* newspaper of Baltimore. The rental paid is $3,600 a year. The building is on F street, midway between the Interior and Treasury Departments.

A Nice, Elevating Sort of Stock.

An Atlanta man, who had just recovered from the Birmingham fever, encountered a fellow-citizen with a bottle of whisky yesterday:

"I say," he remarked, "I'd like to have an option on that."

"How's that?" asked the man with the whisky.

"Why this: I'll give you a quarter for the option; you drink a third of the whisky, I'll drink the other third, then we'll water the stock and declare a dividend."

They disappeared in an alley.—*Atlanta Constitution.*

TECHNICAL.

Locomotive Building.

A locomotive is building at the Rhode Island Locomotive Works for the Boston & Maine Railroad Company, to be used on the summer express trains, that will be the fastest and largest locomotive on the road. It is expected that it will run from Portland to Boston, making 10 stops, in 145 minutes, or a little less than two hours and a half, pulling at the same time a train of six cars, three of which will be parlor cars.

The Car Shops.

Fifty freight cars of an improved style with the Janney coupler and Westinghouse air brake are now being built at the Altoona shops. They are for exhibition at the national display on the Chicago, Burlington & Quincy road in May next.

Bridge Notes.

Miles & Horn, of Atlanta, Ga., have bought the Atlanta Bridge Works and have organized a new company. The title will be the Atlanta Bridge & Axle Co.

The Burlington & Missouri River, the Chicago, Rock Island & Pacific and the Atchison, Topeka & Santa Fe companies will unite in building a bridge at Atchison, Kan.

The Keystone Bridge Co. has been awarded the contract for 2 iron spans, 125 ft. centre to centre of end pins, over Choctaw and Cedar Creeks on the Sherman Branch of the St. Louis, Arkansas & Texas road in Texas.

The Phœnix Bridge Co., of Phœnixville, Pa., have made a contract for a steel bridge to be built across the Ohio River, between Cincinnati, O., and Covington, Ky. It will weigh about 1,500,000 pounds, and will have spans 500 feet long. The contract price is about $1,000,000, and the work will be commenced immediately.

Manufacturing and Business.

The Wainwright Manufacturing Co., of Boston, has recently sold 2 of its corrugated tube feed-water heaters in Boston; one each to Revere, Melrose, Hyde Park and Warren, Mass.; Keene, N. H.; Waterbury, Conn.; Chester, Pa.; Chicago, Brooklyn and 3 to New York.

The New York and Brooklyn Bridge arch in York street, Brooklyn, has been leased by the Clayton Air Compressor Works, of 43 Dey street, New York, for use as a warehouse for the storage of their stock of air compressors of the larger sizes, as the pressure of orders at their works requires all the available floor space.

Iron and Steel.

The Pennsylvania Steel Co. has bought 600 acres of land at Sparrow's Point on Chesapeake Bay, 9 miles from Baltimore, and will erect thereon several blast furnaces. One will be brought from Cuba. The new furnaces are to be connected with the Northern Central Railroad, and the product will be shipped to the works of the company near Harrisburg, Pa.

Henry Disston & Sons, of Tacony, Pa., will increase their steel plant, and are now preparing for the building of an 18 in. bar train and a 9-in. guide mill.

After an idleness of several months, the North Chicago Rolling Mill Company's nail factory, nail-plate mill and cooper shops, at Milwaukee, have resumed operations, giving employment to 200 men. This brings every department of the extensive plant into operation.

The Standard Oil Company intends to build a large iron mill near Oil City, Pa., for the manufacture of hoop iron and wrought-iron pipes. The company consumes about 250 tons of hoops daily for the 50,000 barrels of oil imported, and is also one of the leading consumers of wrought-iron pipes. The mill would need about 150 puddling furnaces to make the necessary product.

The old Northwestern iron mine at Metropolitan, Mich., in the Felch mountain iron district, has been bought by Mayor John K. Stack, of Escanaba, Mich., Henry M. Atkinson, of Metropolitan, and Chicago parties. The company will be reorganized on a new basis and given a new name.

The work of pumping out the mine began two weeks ago, and ore shipping will begin May 1.

The Detroit Steel & Spring Works, Detroit, Mich., are running day and night, and have orders sufficient to keep them busy for six months to come, on their line of car and carriage springs, tool steel, blacksmith and quarry tools.

The Hercules Iron Co., of Eau Claire, with $400,000 capital stock; incorporators, Robert K. Boyd, Christ Huebner, Earl Snodgrass and F. M. Miner, of Eau Claire, and the Garland Manganese Iron Mining Co., of Eau Claire, with $150,000 capital stock; incorporators, Jerome B. Garland, Frank Bolin and E. B. Putnam, of Eau Claire, have filed articles of incorporation in Wisconsin.

The Beaker Ridge Iron Mining Co., of Eau Claire, Wis., has filed articles of association, with $1,000,000 capital stock. The incorporators are: Stephen E. Smith, Frank E. Hines, of Eau Claire; and Augustus R. Darwin and Sylvester M. Scott, of Pepin. The Cunningham Iron Mining Co., of Eau Claire, has also filed articles, with $1,000,000 capital stock. The incorporators are John C. Donnelly and others of Eau Claire.

New companies incorporated are the North Paritan Iron Mining Co., of Milwaukee; capital stock, $1,000,000; incorporators, M. Fitzsimmons, O. J. Leavitt, Edward F. Zinns, A. J. Zinns and Anthony Koenin. Standard Iron Mining Co., of Milwaukee; capital stock, $1,000,000; incorporators, James L. Gates, E. G. Cox and Howard W. Mitchell.

The Lochiel Iron Co.'s furnace and furnace 2 of the Paxon Iron Works, of Harrisburg, Pa., were banked on April 5, and it is said that the Cressonia Nail Works will suspend operations on account of the Inter-state Commerce law. This throws 750 men out of employment.

The Steel Rail Market.

Steel Rails.—The Eastern markets are quiet. A sale of 2,000 tons foreign rails is reported for delivery at New Orleans at $41.25. A sale is reported by an Illinois mill of a 10,000 ton lot. Quotations are nominal at $39@$40.

Old Rails.—No sales of consequence reported. Quotations are $22.50 for foreign double sheets and $22@$22.50 for tees.

Scrap Iron.—Market is very dull, with yard scrap at $24@$24.50, or above buyers' views, and foreign for shipment, $22@$22.50; no inquiry.

Rail Fastenings.—Spikes, 2.50@2.70c. delivered; angle fish bars, 2.20@2.25c.; bolts and nuts, 3.15@3.20c.; and bolts and hexagon nuts, 3.30@3.40c.

The Government asks for Car-Heating Plans.

The Secretary of the Treasury has issued the following circular:

"Congress (House of Representatives) having, on Jan. 21 last, by resolution, requested the Secretary of the Treasury to make inquiries of constructors of passenger cars and of steamboats, and of other persons capable of giving useful information as to the best methods of building railroad cars and heating the same, and constructing steam vessels so as to prevent loss of property and life by fire, the department takes this method of inviting correspondence upon the subject matter of the resolution referred to. Parties offering suggestions are requested to send with them sketches or drawings of their designs when practicable.

"All communications upon the subjects referred to herein should be addressed to the Secretary of the Treasury, Washington, D. C., also indorsing upon the outside, 'Plans for heating railroad cars, etc.'

"Communications received after Nov. 1, proximo, will not be guaranteed consideration, as a report will have to be made to Congress at the commencement of the session in December."

More Fast Tunneling

Shaft 15, on section 7 of the new Croton aqueduct, has again broken the record for fast driving. Foreman John R. Barron, not content with having his name connected with the biggest month's run on record in this country, made last January (326 ft. in 25 days) determined to push his slugger drills a little harder and see what could be done in one week. The best weekly run made last January was 90 ft., which was ahead of anything ever done on the aqueduct before. The work done this time at the south heading of shaft 15 was a progress of 102.1 ft. in the week from Feb. 19 to Feb. 26, with 3 Rand slugger drills No. 13, in 13 shifts, using rackarock powder and working their ordinary force, thus being put to no extra expense. The heading was 9x17 ft.; they fired in each shift.

The character of the rock was a hard quartzite gneiss. The heading bosses under Mr. Barron are Messrs. William Johns and Patrick Haley. This section has recently been put under charge of Messrs. Paige, Carey & Co. The same gentlemen work section 9, and their foreman, Mr. Frank Moran, won last year the prize of $300 at shaft 18½. One point, which in justice to the men and the machinery must be brought out, is that no extra labor was employed in running this remarkable 102 ft.; a little more energy and pushing of the drills was all. The work was done remarkably cheap.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In Pennsylvania the Supreme Court decides that in assessing damages to land from the construction of a railroad the following elements are proper to be considered, viz.: The value of the land actually taken; the injury to the land of plaintiff not taken; the changing of fences rendered necessary; the cutting off of water from plaintiff's fields; the inconvenience of crossing defendant's tracks; the cost of making additional fences and of maintaining the same; the loss to the plaintiff of any portion of the land outside that actually appropriated; and generally all such special items of damages as would tend to depreciate the market value of plaintiff's land at the date of the completion of defendant's railroad through it; but the discontinuance of a railroad station on the land of another person is not an element of damage.[1]

In Pennsylvania it is held by the Supreme Court that on a question of location between rival railroad companies that one which first makes a survey and stakes out a centre line is entitled to a priority of right.[2]

In Missouri, the Federal Court holds that where a railroad company has formerly agreed to allow other railroads to use its right of way under such reasonable regulations and terms as may be agreed upon, and thereafter refuses to allow such privilege to another road, a court of equity has power to enforce the contract, determine the amount of consideration and decide upon the regulations.[3] In New Jersey, the Vice-Chancellor rules that where the charter of a railroad gives the corporation the right to cross highways, but makes it the duty of the corporation to construct and keep in repair good and sufficient bridges or passages over or under the railroad, so that travel over the highway shall not be impeded, an obligation is thereby imposed which requires the corporation to keep the highway, where it is crossed by the railroad, at all times and under all circumstances, in a condition fit for safe and convenient use. He therefore restrained the railroad from using four additional tracks which it had laid down on Spring street, Newark.[4]

In Alabama, under an Act of Congress approved June 3, 1856, certain lands were granted to the state of Alabama to aid in the construction of certain railroads. To the rights of two of them the Alabama & Chattanooga Railroad Co. succeeded, and, before the completion of their road, one D., professing to act as the authorized agent of the company, sold, under two executory contracts, two tracts of these lands—one of 160 acres, and another of 40 acres—with certain reservations, to B., from whom, through several intermediate conveyances, the complainant, M., derived his title. The record showed that these two tracts were not embraced in the first 120 sections which the acts authorized to be sold in order to construct the first 20 miles of the road, and there was neither averment nor proof that the requirements of section 4 of the act of 1856 had been complied with in such manner as to authorize the alleged contracts of sale. The Supreme Court has just decided, in a suit for specific performance of the contracts, (1) that, conceding they were executed by authority of the corporation, the sale having been made before the road was constructed, no title could pass; (2), that the title of B. was not confirmed by any subsequent legislation; (3), that the contract of sale, being void for illegality, was incapable of ratification.[5]

In Minnesota, the Minnesota Central Railroad Co. and the Hastings & Dakota Railroad Co. were each about the year 1866 granted by the state certain lands as well as certain charter privileges. The roads were built by the companies, who thereafter disposed of and transferred the roads to another railroad corporation, reserving the lands and rights granted to themselves. Since that time this third corporation has operated the roads, and the two first have never transacted any railroad business. The transfer was not authorized by any act of the Legislature. The Supreme Court on the application of the state declares the charters and franchises of the two companies forfeited.[6] In New Jersey the Court of Errors holds that the state may interfere to prevent a corporation doing an act in excess of its powers and may revoke its charter for such usurpation.[7]

In Iowa a transfer company which was formed and incorporated to "engage in the general freight and transfer business, and such other business as may not be inconsistent therewith," guaranteed the credit of a third person, and subsequently its officers signed a paper in the name of the company assuming the indebtedness. It was held by the Supreme Court that the company was not bound—a very proper application of the doctrine of *ultra vires*.[8]

In West Virginia, the Federal Court decides that one railroad is liable to be taxed to furnish its share of the aid voted to another railroad company.[9] In Iowa, the Federal Court concedes the power of that state to tax the cars of the Pullman Co. of Illinois, although they may be used in inter-state commerce.[10]

In Minnesota, a line of railroad from Brainerd to Watab, formerly a part of the chartered line of the St. Paul & Pacific Railroad Co. was constructed by the Western Railroad Co. of Minnesota in 1877-78, under Chapter 201, Sp. Laws 1877, by force of which act the forfeited franchises, privileges, and immunities of the former corporation, appertaining to this line of road, were transferred to the latter company. The Supreme Court says that the same obligation, as respects the percentage of earnings to be paid to the state in lieu of taxation, attended the franchises and immunities thus transferred, as the original company would have been subject to if it had constructed this line of road. Hence, pursuant to the provisions of the laws of 1865, this defendant, operating this section of road under lease from the Western Railroad Co., is liable to pay to the state, for the year 1885, *three* per cent. of the gross earnings therefrom.[11] The Supreme Court of Missouri decides that school taxes in that state can be levied on railroad property only for school purposes proper and not for building purposes.[12] In Kentucky it is held by the Court of Appeals that valuation by the Boards of Equalization and a fixing of a rate of taxation by the County Levy Court upon real estate generally of a county, together constitute a sufficient assessment and levy of the property of railroads for county taxation. In this case also the charter of the railroad provided that it should pay to the state a certain sum as taxes, "and no more!" The Court ruled that these words were a limitation as to state taxation only, and did not relieve from county taxes.[13] A Missouri statute of 1853 gave taxpayers a right, where stock in a railroad had been subscribed by a county, to convert their tax certificates into stock. The Supreme Court of the state decides that taxpayers do not acquire a lien upon the property of a railroad company, in the hands of a purchaser after a foreclosure sale subject to equitable liens, by reason of payments made by them upon a subscription of the county to the capital stock of such company, and the refusal of the company to issue stock to them therefor, whether or not such payments entitle them to stock. The fact that the payments were made to one of the contractors for building the road makes no difference.[14] The Supreme Court of Illinois rules that the charter of the Illinois Central Railroad does not exempt from taxation a grain elevator owned by it but not used exclusively by it.[15] In New Jersey the highest court holds that the Central Railroad of New Jersey has no irrepealable contract with the state limiting the exercise of the taxing power.[16] In Pennsylvania it is held by the Supreme Court that a statute of that state requiring foreign corporations to pay a fee for a license to maintain an office in the state is not unconstitutional.[17]

Injuries to Passengers, Employes and Strangers.

From Pennsylvania comes an important ruling upon "coupon" tickets. The Supreme Court decides that it is the duty of the company named in each coupon, where the company selling the ticket is authorized to act as agent for such company, to honor the coupon for one continuous passage over the road named therein, at any time before it expires by its own limitation; and such company is bound by representations of the agent as to stop over privileges. In the case which gave rise to this ruling, a passenger purchased a ticket marked "special limited ticket, good for one continuous passage" over several connecting roads, with a coupon attached for each road, the ticket agent telling the passenger that he could stop off and that the ticket would be good until the date of expiration, which was punched out of the ticket. The passenger stopped off and afterward, before the expiration of its limitation, offered his ticket to the conductor of a subsequent train on one of the roads named in one of the coupons. It was refused and the passenger ejected. The ticket was offered on the next train and accepted. The company on whose line the ejection took place was held responsible in damages.[18]

In Oregon, one S., a switchman and car coupler, was working with another employé under a foreman in switching cars and making up trains. Several flat cars, not before observed by S., which had been received from another road, and were loaded with iron rails, were "kicked" by the switching engine, under the direction of the foreman, on to a side track, to be there coupled to a box car. The rails protruded beyond the end of the flat car, and when S. attempted to make the coupling, his hand, which he had to put up against the box car in order to steady himself, was crushed between the rails and the car. The evidence showed that any employé had a right to complain if a car was so loaded as to be dangerous in coupling, whereupon the load would be rearranged so as to be safe; that cars were frequently coupled while loaded with rails extending 18 or 20 in. beyond the end; that S. himself had coupled such cars; that the rails were likely to be thrown forward when the car bumped; that the distance between cars was about 2½ ft. when the coupling was released, but when they bumped a spring in the bumpers allowed them to come within two feet of each other. S. testified that after the accident he saw that the rails protruded two and a half or three feet beyond the end of the car, but that before it, while the car was approaching, although he saw that the rails protruded, he did not think it was so far. The foreman testified that he uncoupled the flat car from a box car before switching it, and did not notice that the rails projected so as to make it unsafe to couple or uncouple, but saw that there was two or three inches between the rails and the box car. The Supreme Court holds that the railroad is not liable to S. in damages. There was no negligence on its part in supplying proper machinery and appliances, and S. assumed all the dangers of the service.[19] In Pennsylvania, a conductor and engineer forgot to stop and await orders at a way station. There was a collision in which a brakeman on the train was hurt. The Supreme Court holds that the fact that the conductor was sick and had asked to be relieved from duty did not alter the rule that the master is not liable for injuries to one servant by the negligence of a fellow servant.[20]

In Pensylvania, a horse-car driver in broad daylight and with an unobstructed view of the track, started his car at the distance of sixty or seventy feet from a child two years old, who was playing on or near the track, whipped his horses into a trot, disregarded the loud call of a driver approaching on a parallel track and ran over the child. The Supreme Court holds that the company is responsible, although the driver denied seeing the child or understanding the call.[21] In the same state, another verdict in favor of a pedestrian who, while crossing the street, was knocked down by a car is affirmed.[22] In Illinois, a verdict for injuries to a child of seven who was playing on the sidewalk when a car ran off the track in the street to the walk was sustained by the Supreme Court.[23]

A man in a wagon attempted to cross a railroad track (double) in Elizabeth, N. J. He saw no flagman, and, looking both ways, saw no train. As he got on the first track the flagman ran toward him with a flag unfurled in his hand and struck at the head of the horse, checking him. The traveler then saw a train almost upon him, but could not get his horse across because of the flagman's action. The locomotive struck the wagon, throwing the traveler out and injuring him. The trial court ruled that he had no case against the railroad. But the Court of Error of New Jersey, seven judges to six, are of a different opinion.[24]

In Maryland, the Supreme Court again lays down the rule that it is negligence for a person to attempt to cross a track without stopping to "look and listen." The same Court also decides that the negligence of a person in charge of a public or private vehicle is not imputed to a passenger, *i.e.*, the passenger will not be barred of a recovery if he is injured because his driver was negligent.[25]

In Michigan, it is laid down by the Supreme Court, that if a railroad car is left at a crossing so near the traveled part of the highway that a wagon cannot pass without the wheels or whiffle-trees coming in contact with the bumpers it is an obstruction of the highway, and if it so obstructs the highway for a longer time than the statue allows, and frightens a horse attached to a wagon, which runs away and injures the driver, the company is liable for the damage, provided the driver used due care and the accident was not due to the vice of the horse.[26]

In New Jersey, the owner and occupant of a dwelling house in Camden proved that a railroad was accustomed to use its track in front of his house for the purpose of distributing cars and making up trains in its freight and passenger business, and that it kept locomotives and cars laden with live stock standing there, so that by reason of the stenches, noises, smoke, steam and dirt thereby occasioned, the comfort of his home was seriously impaired. The Vice-Chancellor granted an injunction restraining such use of the track by the railroad, which the Court of Error and Appeal approves, except in the case of an emergency, when the railroad may use the track in this way.[27]

In Illinois, owners of land had allowed the water from their property to run into a ditch on the right of way of a railroad. The water overflowed the plaintiff's land. The Supreme Court holds that the railroad is not responsible for the damage.[28]

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[1] Pittsburgh South. R. Co. v. Reed, 5 Cent. Rep., 862.
[2] Davis v. Titusville & Oil City R. Co., 5 Cent. Rep., 903.
[3] Central Trust Co. v. Wabash, St. L. & P. RR. Co., 29 Fed. Rep., 546.
[4] Mayor v. Del., Lack. & W. RR. Co., 5 Cent. Rep., 629.
[5] Swan v. Miller, 1 South. Rep., 65.
[6] State v. Hastings & D. R. Co. and Minnesota Cent. R. Co., 30 N. W. Rep., 816.
[7] Camden & Atlantic R. Co. v. Mays Landing & Egg Harbor City R. Co., 13 Cent. Rep., 800.
[8] Lucas v. White Line Transfer Company, 30 N. W. Rep., 771.
[9] Balt. & O. R. Co. v. County of Jefferson, 29 Fed. Rep., 305.
[10] Pullman's Palace Car Co. v. Twombly, 29 Fed. Rep., 658.
[11] State v. Northern Pac. R. Co, 30 N. W. Rep, 663.
[12] State v. Wabash, St. L. & P. R. Co., 2 S. W. Rep., 275.
[13] Kentucky Cent. R. Co. v. Pendleton County, 2 S. W. Rep., 176.
[14] Spurlock v. Missouri Pac. R. Co., 2 S. W. Rep., 219.
[15] Illinois Cent. R. Co. v. People, 6 West. Rep., 720. People v. Illinois Cent. R. Co., 6 West. Rep., 725.
[16] State v. Bowers, 5 Cent. Rep., 71.
[17] Norfolk & West. R. Co. v. Commonwealth, 5 Cent. Rep., 240.
[18] Young v. Pennsylvania R. Co., 5 Cent. Rep., 848.
[19] Scott v. Oregon R. & Nav. Co., 13 Pac. Rep., 38.
[20] Johnston v. Pittsburgh & West. R. Co., 5 Cent. Rep., 718.
[21] Citizens Passenger Co. v. Costigan, 5 Cent. Rep. 525.
[22] Pitts., O. & E. L. P. R. Co., 5 Cent. Rep., 909.
[23] Chicago, St. Louis & Pittsburgh R. R. Co. v. Welsh, 6 West. Rep., 540.
[24] Berry v. Pennsylvania R. Co., 5 Cent. Rep., 111.
[25] Phila., Wil. & Balt. R. Co. v. Hogeland, 5 Cent. Rep., 587.
[26] Peterson v. Chicago & W. M. R. Co., 31 N. W. Rep., 548.
[27] Pennsylvania R. Co. v. Angel, 5 Cent. Rep., 90.
[28] Chicago & Alton R. Co. v. Glenney, 6 West Rep., 544.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Missouri Pacific, special meeting, at St. Louis, Mo., May 10.

Denver & Rio Grande, annual meeting, at the office, Denver, Col., May 2.

Atchison, Topeka & Santa Fe, annual meeting, Topeka, Kan., May 5.

New York, Chicago & St. Louis, annual meeting, at the office, Cleveland, O., May 4.

Lake Shore & Michigan Southern, annual meeting, at the office, Cleveland, O., May 4.

Delaware & Hudson Canal Co., annual meeting, at the office, New York, May 10.

New York, Susquehanna & Western, annual meeting, Jersey City, N. J., May 5.

Central, of New Jersey, annual meeting, at the office, Jersey City, N. J., May 6.

Long Island, annual meeting, at the office, Long Island City, N. Y., April 12.

Michigan Central, annual meeting, at the office, Detroit, Mich., May 4.

St. Louis & San Francisco, annual meeting, at St. Louis, Mo., May 11.

Vicksburg & Meridian, annual meeting, at the office, New York, May 2.

Chicago, Burlington & Quincy, annual meeting, at Chicago, May 18.

Ohio Southern, annual meeting, at the office, Springfield, O., April 18.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Boston & Albany, 2 per cent., quarterly, payable Sept. 30.

Pittsburgh, Virginia & Charleston, 2½ per cent, payable on and after April 4.

St. Paul, Minneapolis & Manitoba, 1¼ per cent., quarterly, payable May 2, to stockholders of record April 11.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *General Time Convention* will hold its spring meeting in New York City, on Wednesday, April 13.

The *Car Accountants' Association* will hold its annual convention in Atlanta, Ga., beginning on Tuesday, April 19.

The *Master Car-Builders' Club* holds its regular meetings at the rooms, No. 113 Liberty street, New York, on the third Thursday in each month.

The *New England Railroad Club* holds its regular meetings at its rooms in the Boston & Albany passenger station in Boston, on the second Wednesday of each month.

The *Western Railway Club* holds its regular meetings at its rooms in Chicago on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Association of North American Railroad Superintendents* will hold a meeting at the Hotel Brunswick, N. Y., on April 12.

American Society of Civil Engineers.

A regular meeting of this society was held April 6. The Norman medal for 1886 was awarded to Mr. Edward Bates Dorsey for his paper on American and English Railroads.

Ballots for membership were canvassed.

The discussion of Mr. Metcalf's paper on the Properties and Uses of Steel was continued and closed. The discussion turned chiefly on the use of steel for heavy guns.

The Burlington Brake Tests.

The Committee of the Master Car-Builders' Association on Freight Train Brakes have issued the following circular:

"AURORA, Ill., March 31, 1887.

"Up to date, the following brake companies have notified the Committee that they have made arrangements for cars and engines, and will be present at the Burlington brake tests, commencing May 9: Eames Vacuum Brake Co., Boston, Mass.; Carpenter Brake Co., Berlin, Germany; Westinghouse Air Brake Co., Pittsburgh, Pa.; Card Electric Brake Co., Cincinnati, Ohio; American Brake Co., St. Louis, Mo.; Hanscom Brake Co., San Francisco, Cal. The Parke Electric Brake Co., of Chicago, Ill., and the Rote Brake Co., of Mansfield, Ohio, have their brakes ready, but have not yet succeeded in arranging for cars. The Committee will not debar them or any other company from the tests, providing they get their cars to Burlington by May 9, 1887."

"The Boyer speed recorder will be used in the dynamometer car at the coming brake trials. It is important that the engines be fitted with the same recording apparatus, and each competitor is requested to so equip the engine to be used by his company. The recorders are made by Mr. Jos. Boyer, Dixon street, near Fourth, St. Louis, Mo."

"During the brake trials, in order to obtain an accurate record from the middle car, the recording mechanism will be attached to a pair of 33-in. steel-tired wheels; one pair will be furnished by the committee to each competitor, accurately turned to the same diameter. In order that the wheels may be mounted on axles that will fit the trucks, each competitor is requested to forward at once a drawing of the axle that will be used under his cars. Drawings of the flooring of the cars, with the brakes attached, showing the levers and connections, spacing of sills, cross-ties and transoms, are also requested to enable the Committee to make complete arrangements for fitting up the middle car recording apparatus prior to the trials."

PERSONAL.

—R. S. Minor has resigned the position of Superintendent of the Louisville, Evansville & St. Louis.

—George R. McKenzie, President of the Singer Sewing Machine Co., has resigned as a director of the Central, of New Jersey.

—F. J. Whitney has been presented with a silver tea service and an elaborate china tea and dinner set by his friends on the Michigan Central.

—William A. Armstrong, of Elmira, N. Y., and James R. Buckbee, of Greenbush, have been nominated for Railroad Commissioners by Governor Hill.

—Mr. George M. Pullman has been knighted by the King of Italy. While it is a matter of conjecture just why this distinction has been conferred on him, still we tender to Sir. George the assurances of our distinguished consideration.

—George Doogan, a conductor on the Little Miami road, celebrated the thirty-fifth year of his connection with the company last week. A computation of the number of miles traveled by him since he first started as brakeman shows a distance covered equal to sixty trips around the world.

—Howard M. Koehersperger, who has just been appointed to the new office of Comptroller of the New York, New Haven & Hartford, is a Philadelphian by birth, and has had 14 years experience in railroad auditing on the Philadelphia & Reading, the Atchison, Topeka & Santa Fe, and the New York & New England. He was with the last-named road for 6 years.

—General John T. McNulta, just appointed Receiver of the Eastern Wabash lines, is a resident of Bloomington, Ill., and was for a long time the law partner of Judge Weldon of the Court of Claims. During the civil war he served in the cavalry of the Federal army. He was the Receiver of the Toledo, Cincinnati & St. Louis narrow gauge road, being appointed by Judge Drummond. His age is 45, he is short of stature, with black hair and cropped moustache.

ELECTIONS AND APPOINTMENTS.

Alexandria & Texas.—The incorporators of this new Louisiana company are: Amos B. Watson and William M. Robinson, of Grand Rapids, Mich., and Franklin H. Head, of Chicago, besides several citizens of Alexandria, La.

Anniston & Cincinnati.—At a directors meeting the following officers were elected: A. L. Tyler, President; Samuel Noble, Vice-President; D. T. Parker, Treasurer; H. L. Wright, Secretary; C. C. Wrenshaw, Chief Engineer.

Atlantic Coast Line.—E. T. D. Myers has been made General Manager of the division extending from Quantico, Md., to Weldon, N. C.

Baltimore & Ohio.—William M. Clements has been appointed Manager of all the lines of this company east of the Ohio River, which includes the main stem and branches, the Pittsburgh Division and the Pennsylvania Division; headquarters at Baltimore, Md. W. W. Peabody is appointed Manager of the lines west of the Ohio River, which include the Central Ohio and the Lake Erie, Straitsville and Chicago Division; headquarters at Newark, Ohio.

S. J. Frazier has been appointed Superintendent of Maintenance of Way on the Chicago Division.

Birmingham, La Grange & Macon.—The board of directors is made up as follows: John T. Milner, John T. Heflin, J. F. B. Jackson, B. H. Bingham, B. F. Roden, George L. Morris, William C. Yancey and Robert L. McFarlin. The board of directors elected officers of the company as follows: John T. Milner, President; B. F. Roden, Secretary.

Boston & Lowell.—H. N. Turner has been appointed General Traffic Manager; D. C. Prescott, General Freight Agent; George W. Storer, General Passenger Agent.

Buffalo, New York & Philadelphia.—Herbert G. Walker has been appointed Traveling Auditor for this company.

Central, of Georgia.—F. M. Fonda is Superintendent, with headquarters at Savannah, of the main division, which includes the Savannah, Griffin & North Alabama, the Upson and the Eatontown roads. W. H. McClintock is Superintendent of the Columbus & Western Division, with headquarters at Columbus. W. W. Starr is Superintendent of the South Carolina Division, with headquarters at Augusta.

Chicago & Alton.—At the annual meeting in Chicago this week all the old officers were re-elected.

Chicago & Eastern Illinois.—The directors are Richard M. Hoe, David Dows, Jr., Ogden Mills, A. R. Flower and H. H. Hollister. R. M. Hoe has been chosen for President and Horace H. Stevens for Vice-President.

Chicago, Kansas & Nebraska.—D. Atwood has been appointed General Freight Agent.

Chicago, Rock Island & Pacific.—H. Gower has been appointed Second Assistant General Freight Agent.

Chicago, St. Louis & Pittsburgh.—I. L. Davis has been appointed Soliciting Agent, vice W. W. Hill, resigned.

Cincinnati, Huntsville & Birmingham.—Officers elected are: William Richardson, President; M. J. O'Shaughnessy, Vice-President, and B. P. Hunt, Secretary.

Cincinnati, Washington & Baltimore.—John Halpin has been appointed City Passenger Agent at Cincinnati, O.

Columbus & Cincinnati Midland.—The directors are: Orland Smith, Cincinnati; Samuel Spencer, Baltimore; Geo. Hoadly, New York; Henry Miller, Charles Parrott, T. Ewing, G. C. Hooker, J. A. Wilcox and P. W. Huntington, Columbus. The officers are: Orland Smith, President; T. H. Butler, Treasurer; and S. P. Peabody, Secretary and General Manager.

Columbus & Western.—F. Y. Dabney has been appointed Chief Engineer in place of E. A. Flemelyn, resigned.

Cumberland & Pennsylvania.—L. S. Randolph has been appointed Master of Machinery for this road at Mount Savage, Md.

Dallas Consolidated.—The projectors of this new Texas road are: J. E. Henderson, J. E. Schneider, T. J. Oliver, J. N. Simpson, J. G. Trezevant, W. H. Flippin and W. H. Gaston.

Detroit, Mackinac & Marquette.—William Orr has been appointed General Freight Agent, with headquarters at Marquette, Mich.

Duluth, South Shore & Atlantic.—William Orr has been appointed General Freight Agent, with headquarters at Marquette, Mich.

Eufaula & St. Andrews Bay.—At a meeting in Eufaula, Ala., the following directors were elected: S. H. Dent, J. W. Tullis, W. N. Reeves, H. Lampley, J. M. Thuratt, M. M. Berringer, L. Y. Dean, R. J. Reynolds, R. Q. Edmundson, Eli S. Shorter. The following were elected officers: W. N. Reeves, President, and H. Lampley, Secretary and Treasurer.

Florida Railway & Navigation Co.—W. D. Ballentine has been appointed Master of Machinery for this company, vice L. S. Randolph, resigned.

Galveston, Houston & Henderson.—At the annual meeting in Galveston, Tex., this week, the following board of directors was elected: Jay Gould, Russell Sage, James A. Baker and F. A. Rice, of New York; William P. Ballinger, H. G. Fleming and B. W. McCullough, of Texas. The board elected Jay Gould President; J. A. Baker Vice-President, and D. T. H. Smith Treasurer.

International & Great Northern.—At the annual meeting in Palestine, Tex., this week, the following directors were elected: Jay Gould, Russell Sage, S. H. H. Clark, A. L. Hopkins, Ira H. Evans, James A. Baker, F. A. Rice, W. R. Maxwell and H. C. Fleming.

Iowa Railroad Commission.—Senator G. S. Robinson, of Storm Lake, Ia., has been appointed Railroad Commissioner, in place of Judge McDill.

Kansas City, Fort Scott & Gulf.—W. W. Fagan has been appointed Superintendent of this and the Kansas, Springfield & Memphis and Kansas City, Clinton & Springfield Railroad companies, in place of L. W. Towns, resigned. Mr. Fagan's office will be at Kansas City, Mo.

Kansas & Colorado.—The directors of this new company are: George J. Gould and A. H. Calef, of New York; Geo. C. Smith and E. G. Merriam, of St. Louis; David Kelso, of Parsons, Kan.; John Wilson, M. D. Teague, Henry Baker and C. E. Faulkner, of Salina.

Kansas Railroad Commission.—A. R. Green, of Chatauqua County, Kan., has been appointed Railroad Commissioner for a term of 3 years.

Lincoln & Black Hills.—The incorporators of this new Nebraska company are: G. W. Holdredge, J. G. Taylor, C. D. Dorman, C. J. Greene and W. A. Higgins.

Lincoln Rapid Transit.—The incorporators of this Lincoln, Nev., company are: J. W. McDonald, Joseph Boehmer, K. K. Hayden, H. C. Melone, J. C. McBride, R. P. Beecher, J. P. Walbon, J. G. White, Sam McClay, E. L. Trickey, Thomas Ryan, D. W. Moseley, G. A. Bush, D. L. Brace, A. Halter, J. R. Webster, J. J. Imhoff, Thos. H. Hyde, Alex. Culver, Geo. E. Bigelow and J. B. Trickey.

Lookout Mountain.—C. E. James is President of the new Tennessee Company. John P. Richardson, of New Orleans, and Edward Watkins, of Meridian, Miss., are stockholders.

Louisiana, Moberly & Omaha.—The officers and directors of this new Missouri company are: President, G. F. Rothwell; Vice-President, Julius Lotter; Treasurer, Julius Miller; Secretary, W. B. Stewart. Directors, John T. Zimmerman, of Chicago; Henry B. Sage, of New York; Adam Given, W. F. Elliott, G. L. Hassett, B. F. Harvey, George B. Kelley, L. Grimes, J. S. Hedges.

Louisville, Evansville & St. Louis.—Otis Kimball has been elected Treasurer of this company.

Louisville & Nashville.—William Alfred Kellond has been appointed Assistant to the General Manager.

Marquette, Houghton & Ontonagon.—E. W. Allen has been appointed Auditor and Assistant Treasurer, in place of G. S. Hobbs, resigned. Headquarters at Marquette, Mich.

Michigan Central.—The passenger department has been re-organized as follows: W. R. Busenbark, Assistant General Passenger Agent; George A. King, Assistant General Ticket Agent, with headquarters at Chicago; W. H. Underwood, Eastern Passenger Agent, Buffalo. Newell Pettee and C. A. Carscadin, Traveling Passenger Agents, Buffalo; John G. Laven, Canadian Passenger Agent, Tronto, Ont.; L. L. Caufy, Wisconsin Passenger Agent, Milwaueee, Wis.; D. W. Johnston, Michigan Passenger Agent, Grand Rapids, Mich.; W. L. Wyand, Northwestern Passenger Agent, St. Paul, Minn.; H. H. Marley, Southwestern Passenger Agent, Kansas City, Mo.; P. P. Murray, Western Passenger Agent, Chicago; Amos Burr, Pacific Coast Agent, San Francisco, Cal.

Milwaukee, Lake Shore & Western.—H. W. Reighley is Purchasing Agent, with office at Milwaukee, Wis.

Minnesota & Northwestern.—John H. Eames is Purchasing Agent, with office at St. Paul, Minn.

Mobile & Ohio.—George D. Harris has been appointed Superintendent of Motive Power of this road.

New York Central & Hudson River and West Shore.—Frank J. Wolf has been appointed Passenger Agent of both roads east of Syracuse and Oswego, N. Y. Headquarters at Albany, N. Y.

New York, Lake Erie & Western.—W. T. Conner has been appointed General Traveling Agent of this line.

New York & New England.—E. G. Allen is Superintendent of the Eastern Division and C. H. Platt Superintendent of the Western Division.

New York, New Haven & Hartford.—Henry A. Bishop has been appointed Purchasing Agent, with headquarters in New Haven, Conn. Stacey B. Opdyke has been appointed Assistant Engineer, with office at New Haven. H. M. Kochersperger has been appointed Controller. W. H. Elliott is Storekeeper.

New York, Wheeling, St. Louis & Chicago.—The incorporators of this new Illinois company are: J. E. Williams and E. C. Rice, St. Louis; W. E. Beckwith, Thomas L. Fekete and E. C. Rhoads, East St. Louis.

New York, Woodhaven & Rockaway.—Austin Corbin has been elected President, to succeed James M. Oakley, deceased. J. Rogers Maxwell is elected Vice-President.

Norfolk & Western.—M. C. Jameson is Comptroller, vice William G. McDowell, elected Treasurer.

North & South Alabama.—R. S. Minor has been appointed Superintendent.

Oregon, Southern Pacific Coast & Utah.—The officers elected are: Asher Marks, President; D. S. K. Buick, Vice-President; C. W. Johnson, Secretary; S. C. Flint, Treasurer.

Pacific.—The directors of this Kansas company are: Cyril Williams, of St. Louis; F. P. Bonnell, of Superior, Neb.; A. S. Everest, of Atchison, and Paul S. Williams, of Baltimore.

Panama.—At the annual meeting this week the former officers were elected and the old board of directors with one exception. C. H. Coster was substituted for J. Hood Wright. The board is now made up as follows: J. G. McCullough, Richard W. Thompson, Jesse Seligman, C. H. Coster, John W. Ellis, Theodore J. De Sabla, D. O. Mills, Charles G. Francklyn, Joseph Ogden, William B. Dinsmore, Thomas Maddock, George Garr and Edward F. Winslow.

Philadelphia & Reading.—A. W. Guy is appointed Paymaster, with office at Philadelphia, vice D. E. Stout, assigned to other duty.

St. Louis, Arkansas & Texas.—Mr. J. F. Hinckley, Chief Engineer, has charge of the construction work from April 1 and all employés of the construction department and contractors for graduation, bridging, cross ties, etc., to be used in construction, will be under his immediate supervision.

St. Paul & Northern Pacific.—J. H. Randall has been appointed Controller, in place of A. G. Postlethwaite, resigned.

Santa Rosa & Carquinez.—The incorporators of this California company are: Leland Stanford, Charles F. Crocker and Willard V. Huntington, of San Francisco; Stephen T. Gage, of Alameda, Cal., and Mark L. McDonald, of Sonoma, Cal.

Santa Rosa, Sebastopol & Green Valley.—The directors of this new California company are: George Whittel, of San Francisco; John Walker and Chas. Solomon, of Sebastopol, and F. X. Loughery and Guy E. Grosse, Santa Rosa, Cal. F. X. Loughery is Treasurer.

Staten Island Rapid Transit.—At the meeting held this week the old board of directors was re-elected.

Richland.—The incorporators of this new Tennessee company are: O. F. Noel, J. E. Caldwell, Thomas Parkes, J. S. Caldwell and Richard Douglass.

Richmond & Alleghany.—William Hassman has been appointed Master Mechanic of this road, vice G. D. Harris, resigned.

Tacoma Railway, Dock & Navigation Co.—The directors of this new company in Washington Ter. are: S. M. Nolan, J. F. Hart, Frank C. Ross, W. B. Kelley, A. J. Littlejohn, W. H. Veazie and Philip Meltzter. The officers are: President, Philip Melzter; Vice-President, A. J. Littlejohn; Secretary, Frank C. Ross; Treasurer, S. M. Nolan.

Union Pacific.—The President has reappointed the following men as government directors: Frederic R. Coudert, of

New York; Franklin MacVeagh, of Chicago; Alexander Haskell, of Columbia, S. C.; Marcus A. Hanna, of Cleveland, and James W. Savage, of Omaha.

Wabash, St. Louis & Pacific.—The following appointments are announced: William Flannelly to be City Ticket Agent in St. Louis; James Garvey to be Traveling Passenger Agent at St. Louis; C. P. Fegan to be Southwestern Passenger Agent, with headquarters at Dallas, Tex., vice B. P. Humphrey, resigned; E. P. Wilber to be Northwestern Traveling Passenger Agent at Milwaukee, vice E. McKeon, resigned.

General John T. McNulta, of Bloomington, Ill., has been appointed Receiver of the lines east of the Mississippi, the position left vacant by Judge Cooley.

OLD AND NEW ROADS.

Addison & Northern Pennsylvania.—This road, which is from Addison, N. Y., to Galeton, Pa., 46 miles, will be sold to the highest bidder in Bath, N. Y., May 5.

Alexandria & Texas.—Incorporated in Louisiana, and the proposed road is from Alexandria through the counties of Rapides, Vernon and Calcasieu to the Sabine River, thence to Houston, Tex. The latter place is 215 miles straightaway from Alexandria. The capital stock of the company is fixed at $1,500,000.

Baltimore & Ohio.—The directors have voted $25,000 cash and $20,000 each year to endow the technological school at Mt. Clare, Md., where technical instruction in matters relating to the railroad service can be acquired.

Birmingham, Georgia & Florida.—Surveys are progressing on this road, which is to run from Birmingham, Ala., to St. Marks, Fla., on the Gulf coast. The road will connect just below Cuthbert, Ga., with the Brunswick & Albany road, making a route 86 miles shorter than any now existing to the seaport of Brunswick. At Arlington, Ga., it will connect with the Southwestern of Georgia, and at Bainbridge with the Savannah, Florida & Western system. Finally, at Tallahassee, by a connection with the Florida Railway & Navigation Co.'s lines, it will afford a route to Tallahassee and Tampa, Fla., shorter by 130 miles than any other now operating.

Boston & Lowell.—It has been thought that the recent decision of the New Hampshire Court, stating that the lease of the Northern road to this company was invalid, would also affect the lease of the Boston, Concord & Montreal to the Boston & Lowell. But the company does not take this view, and will continue to operate the Montreal road until compelled to give it up by a judicial decree. The people of Littleton, N. H., have prepared a testimonial and presented it to the Boston & Lowell Co., in which they express their appreciation of the efficient and liberal services that have been given on the White Mountain Division of the Boston, Concord & Montreal. The paper is intended to be used as a strengthener to the Boston & Lowell's claims, if necessity requires.

Boston & Maine.—The company is to build a stone bridge over Salmon Falls River near South Berwick, N. H.

Central of Georgia.—The system has been reorganized. The line from Atlanta to Savannah, including the Savannah, Griffin & Northern Alabama, the Upson and the Eatontown roads, is now known as the Main Stem division. The Columbus & Western Division will embrace all the lines west of those named. The South Carolina Division will consist of the Augusta & Savannah, the Port Royal & Augusta, the Augusta & Knoxville, the Spartenburg, the Savannah Valley and the Greenwood & Laurens.

Charleston, Cincinnati & Chicago.—The Virginia Legislature has given permission to the company to build its road. The proposed route is from Charleston, S. C., to Sumter, crossing the Santee River at the most practicable point, thence to Camden, Lancaster, Rock Hill, Yorkville, Blacks, in South Carolina, thence to Rutherford, Marion, Cramberry in North Carolina, thence to Johnson City, in Tennessee, thence to Estilville to the breaks in the Cumberland Mountain, Virginia, thence down the Sandy River to Ashland on the Ohio River, thence down the Ohio River to Cincinnati. The enterprise is considered highly important to the section through which the road is to pass. The company now has under contract that portion between Camden and Blacks, and has completed the road from Blacks to Rutherfordton, S. C.

Chicago, Burlington & Quincy.—At the annual meeting to be held on May 18, the stockholders will be asked to approve the action of the directors in regard to aiding in the construction of and leasing and purchasing the following railroads and their branches: The Galesburg & Rio, the Nebraska & Colorado, the Omaha & North Platte, the Grand Island & Wyoming Central, the Republican Valley & Wyoming, the Oxford & Kansas, the Republican Valley, Kansas & Southwestern, the Chicago, Nebraska & Kansas, the Beaver Valley and the Eastern Colorado.

The company has let contracts for 400 miles of road from Central City, Neb., to the northwest. This line will run from Central City through Merrick, Howard, Greely, Wheeler, Garfield, Brown and other counties. The company has notified all its agents that all second-class passenger rates from Chicago, Peoria and St. Louis to the Missouri River are abolished. After this all passengers holding second-class tickets from these and intermediate points will be given first-class accommodations.

Chicago & Eastern Illinois.—The road has passed into the hands of a syndicate represented by H. H. Porter, R. P. Flower and others. The first named is President of the Chicago & Indiana Coal Co., and that road can now obtain a direct line into Chicago by means of the Louisville, New Albany & Chicago, or by building a new line between Fair Oaks and Dalton.

The Chicago & Eastern Illinois runs from Chicago to Terre Haute, Ind., a distance of 178 miles, but it owns and controls altogether 246½ miles of road. Its main line runs from Dolton, Ill., to Danville, Ill., and it controls under lease the Evansville, Terre Haute & Chicago, from Danville to Terre Haute. It also owns the following branches: Indiana Division, from Covington, Ind., to Coal Creek, Ind.; Grape Creek Division, from Danville, Ill., to Sidell's Grove, Ill.; Wellington Branch, from Cissna Park, Ill., to Wellington, Ill. Besides, it operates under lease the Rockport extension of the Evansville & Terre Haute and the Indiana Block Coal Railroad from Otter Creek, Ind., to Brazil, Ind. It also has a trackage contract with the Indiana, Bloomington & Western from Danville, Ill., to Covington, Ind. In addition to these possessions the company owns one-fifth interest in the Chicago & Western Indiana, which runs from Dolton to Chicago, with superior terminal and depot facilities in the heart of the city. The capital stock of the Chicago & Eastern Illinois is $3,000,000. The price paid for the stock by the new syndicate was $1.10 per share.

Chicago & Northwestern.—There appears to be a slight mistake in the statement somewhat extensively circulated to the effect that this company is rapidly extending its line through Nebraska and is reaching out for Denver. General Manager Marvin Hughitt says that no lines have been completed since the first of the year, and, excepting a few miles of local track in Nebraska, the directors have not determined upon future construction.

Chicago, Santa Fe & California.—The company has filed a trust deed and mortgage securing the company's first mortgage bonds, amounting to $1,500,000, and, covering the road between Chicago and Streator, Ill. It is given to the Boston Safe Deposit Co.

This company has made a contract giving them the right to enter Chicago over the tracks of the Chicago & Western Indiana.

Cincinnati, Huntsville & Birmingham.—Articles of incorporation filed in Alabama.

Cleveland & Canton.—The Corbin-Parlin interest has issued another circular to the stockholders of the company in which the methods of the Blood management are reviewed and generally denounced. An invitation is extended to the stockholders to send their proxies to Messrs. Corbin, Thomas and Parlin. At the election on May 11 both parties will vote to mortgage the road.

Columbus, Hocking Valley & Toledo.—Stevenson Burke, Charles Hickox and Charles G. Hickox will file their answers to the charges of John W. Shaw, President of the company, in his $8,000,000 suit against the former managers of the road, on April 9. This, it is said, does not indicate an early trial, as the contents of the answers may raise new issues that will require additional pleadings from President Shaw. The case will be before Judge Evans in the Court of Common Pleas, Columbus, O.

Concord.—The stockholders of this company have arranged a plan with the Haverhill & Lawrence people by which both roads are to obtain a terminus in Boston. The Concord is to build a branch road from the Manchester & Lawrence at the New Hampshire line through Lawrence, thus connecting with the Haverhill & Lawrence, thence both running together across the Merrimac River, thence over the bed of the old Mystic Valley road to Cambridge, Mass., connecting there with the Fitchburg into Boston.

Dallas Consolidated.—This company has been organized in Dallas, Tex., with a capital stock of $500,000.

Dayton & Ironton.—This road was changed to standard gauge on Sunday last. The road runs from Dayton, O., through Xenia and Chillicothe to Ironton, 167 miles, and is a part of the Cincinnati, Hamilton & Dayton system.

Duluth, Red Wing & Southern.—Right of way will be bought now and the road soon located. The road is expected to run from Red Wing, Minn., up the Wisconsin bank of the Mississippi River to Duluth, avoiding St. Paul and Minneapolis.

Erie & Wyoming Valley.—The opening of this company's new line between Scranton, Pa., and New York will take place on April 9.

Eufaula & St. Andrews Bay.—The survey is completed between Eufaula, Ala., and St. Andrews Bay, Fla. In 100 miles there are no bridges needed. Contracts for construction are to be let shortly.

Fitchburg.—The company will purchase the Hoosac Tunnel dock and elevator in Charlestown, Mass. This will necessitate an increase in the railroad company's capital of $1,512,500.

Florida Southern.—The company proposes to build a road from a point on its line near Palatka, Fla., to Ocala, about 45 miles. The road will be standard gauge.

Forth Worth & Rio Grande.—The track on this road between Fort Worth and Granbury, Tex., is laid for 18 miles, and now reaches Mustang, in Denton County.

Georgia Pacific.—The track on the extension from Columbus, Miss., to Starkville was connected last week, completing a distance of 30 miles. The location of this line was begun in the latter part of last January. Some little bridge work is yet to be completed on the line. Trains are expected to run from Atlanta, Ga., to Starkville in about two weeks from now. It is said that the continuation of the line across Mississippi to Greenville is now contemplated.

Gulf, Colorado & Santa Fe.—Work is progressing in the Indian Territory. The Canadian River will be reached during the present month, and through trains from Fort Worth to Kansas City are promised for May 1.

Illinois Central.—This company will surrender the lease of the Dubuque & Sioux City next October, and will at once begin building a new line parallel to the latter road. Surveyors are now at work.

Inter-colonial.—The worst snow blockade experienced in many years on this road was the one of last week. About 1,500 passengers were caught in trains that got buried at River du Loup, St. Luce and St. Flavien in Quebec.

Jeffersonville, Madison & Indianapolis.—A contract for building a round-house and freight houses for this company at Louisville, Ky., has been let to Peter Routier, of Indianapolis, Ind. The cost will be about $180,000.

Kansas & Colorado.—Charter filed in Kansas for a road to be built from Salina, Kan., west to Pueblo Col., about 100 miles. Capital stock, $1,500,000.

Lake Erie & Western.—The Indianapolis, Peru & Chicago will hereafter be known as the Indianapolis & Michigan Division of the above-named company.

Lincoln & Black Hills.—Articles of incorporation filed in Lincoln, Neb., the proposed road to run from Central City, in Merrick County, northward through the counties of Merrick, Howard, Greeley, Wheeler, Garfield, Holt, Brown and Keya Paha, to a point on the Dakota line. It is to have branches in the counties of Merrick, Howard, Sherman, Valley, Greeley, Garfield, Custer, Loup, Blaine, Brown, Cherry, Nance, Boone and Wheeler; also in unorganized territory lying west of Blaine and south of Cherry counties. The capital stock is $5,000,000.

Lincoln Rapid Transit.—Articles of incorporation for a company to build city and suburban rapid transit roads in Lincoln, Neb.

Little Rock & Fort Smith.—The road has passed under control of the Missouri Pacific, and work upon the extension of the line is to begin at once. This is to be from Van Buren, Ark., to Fort Gibson, Cherokee Nation, and 4 miles of track is now laid out from the first-named place. The line will be built to a point on the Arkansas River opposite Fort Smith, Ark., where a cantilever bridge is to be constructed. A road is also to be built from Fort Smith to Shreveport, La., where it will connect with the New Orleans & Texas. Work on this latter line will begin within 60 days.

Lookout Mountain.—Organized in Chattanooga, Tenn., to build a broad gauge road up Lookout Mountain. All the money required for construction is subscribed. A narrow-gauge road up the mountain was recently completed and put into operation.

Louisiana, Moberly & Omaha.—This is a new company, organized last week in Missouri.

Louisville & Nashville.—A preliminary contract has been made between this company and the Norfolk & Western, by the terms of which it is agreed to have surveys immediately made by both companies for an extension of its lines to a connection in Wise County, Va. The extension of the Louisville & Nashville will be from Corbin Station, on their present Knoxville branch, through the Cumberland Valley, of Kentucky, and the extension of the Norfolk & Western will be from Graham Station, on their New-River Division, through the Clinch Valley, of Virginia. The total length of line to be constructed is about 200 miles. It is expected that the entire line will be completed within the next twelve months.

Louisville, St. Louis & Texas.—The company has filed a first mortgage in favor of the Central Trust Co., of New York, for $2,800,000 on its roadbed and franchise between Louisville and Henderson, Ky. It has also filed a second mortgage for $250,000.

Maricopa & Phœnix.—This road is completed from Maricopa, Arizona, to the Gila River. It is thought that trains will be running to Tempe, 25 miles, by another month. Salt River will be bridged on the way to Phœnix, which place is expected to be reached by June 1.

Mexican Central.—The engineers are now locating the route from Iraputo to Guadalajara, Mex.

Minnesota & Northwestern.—This company has purchased the Dubuque & Dakota road. It is from Hampton to Sumner, Ia., 63 miles.

Missouri Pacific.—It is said that this company has bought a large amount of land in the suburbs of St. Louis, Mo., and intends to build an industrial village there, with fine shops and ideal residences for its workmen. The idea is suggested, most likely, by the very successful town of Pullman.

Mobile & Birmingham.—This road, which was begun about 6 months ago, is nearly completed from Mobile to Jackson, Ala., 57 miles. There was about 5 miles of pile driving required. The Tombigbee River is to be spanned by an iron bridge, work upon which is now well advanced. The object is to build the road through to Selma and Birmingham.

Nevada & California.—It is said that the road will be extended from its present terminus at Moran, Cal., 57 miles to Hot Springs, which is 25 miles east of Susanville, a thriving town in Lassen County, Cal. The rails for this extension have been bought in New York.

Newport News & Mississippi Valley.—The recent attempt to repeal this company's charter has failed. The Legislative Committee on the Judiciary in Connecticut decides that the company has not exceeded its charter in any of the ways that were charged.

New Roads.—I. G. Wildee, of Honolulu, has just sailed from San Francisco with a corps of engineers to locate a road across the island of Hawaii, from Hilo to Hawakam, taking in the best sugar districts of the island.

A company has been organized in Ansonia, Conn., to build an electric railroad 3½ miles long from Derby to Birmingham and Ansonia. Wires strung overhead will conduct the electric current, the motive power of which will be furnished by the Housatonic dam.

New York, Chicago & St. Louis.—The official order for the sale of this road has been placed on record in Cleveland, O., this week. D. W. Caldwell, Receiver of the road, is appointed Master Commissioner to conduct the sale. The property will be sold, after 30 days' notice has been given, for not less than $16,000,000.

New York, Lake Erie & Western.—The bill to exempt this company from the provisions of a law passed in 1874, which prohibited any company doing business in Pennsylvania as a common carrier from owning land except for the purpose of carrying its regular business, has passed the Pennsylvania Senate. The bill was originally introduced to save to the railroad company 70,000 acres of coal land in the western part of the state, valued at $4,000,000.

The company has made a good innovation in the way of baggage checking. An order can be given at any ticket office in New York, and the baggage will be called for, checked and forwarded to its distination and delivered, and the price for this is one dollar.

New York, Lake Erie & Western.—The contractors for the new station in Jersey City are Cofrode & Sayler, of Philadelphia.

New York & New England.—This road has been formed into two divisions. It has been in three heretofore. These new divisions will be the Eastern and Western, the latter including the main line from Fishkill, N. Y., to East Hartford, and the former taking in the main line and branches from Boston to Hartford.

New York, New Haven & Hartford.—Counsel for the company appeared before the Railroad Committee in Connecticut in answer to the memorial of Henry L. Goodwin and explained the apparent discrepancies contained in the last annual report.

The company holds that $440,494, the sum named in the memorial, has been deducted from the original valuation of the Northampton Company's stock investment as made by the Sinking Fund Committee. That one dollar of this sum was derived from the company's railroad earnings is untrue. The company explains that 12,298 shares of the Canal Company's (New Haven & Northampton) stock was purchased at par in order to prevent that line falling into hands of a competing line out of the state, the Boston & Albany. When these shares were transferred to the custody of the Sinking Fund Committee they were entered upon their accounts at the current market value of the stock, $60 a share, so that they first appeared in their sinking fund account at $737,880. The stock of the Northampton Company has been constantly depreciating in the market. In 1886 the Sinking Fund Committee entered a reduction of its valuation, bringing it down to $29,738,586, being about $25 a share. The difference in these two valuations, $440,495, is the amount which the sinking fund has received by way of income, profits on sales, etc., since it was begun in December, 1881.

New York, Wheeling, St. Louis & Chicago.—Incorporated in Illinois. The proposed road is from a connection with a road of the same name in Indiana at a point on the boundary line between the states to East St. Louis, Ill. Capital stock, $5,990,000. A survey has been made.

Northern Pacific.—Upon the application of the company for the issue of patents for lands along its lines in Minnesota and Dakota east of the Missouri River, Commissioner Sparks has reported to the Secretary of the Interior, recommending that patents be issued to the company for lands along so much of the road as lies between a point near Duluth, in Minnesota, and the Missouri River, in Dakota, but states his opinion that no lands should be patented to said company for lands on any other portion of the road.

Norwich & Worcester.—A verdict of $173,175 has just been rendered in Massachusetts against this company. It is to pay nine land owners with 6 per cent. interest for land taken as a site for the new freight house in Worcester. The verdict makes the cost of the improvement more than $250,000.

Ohio & Mississippi.—A quo warranto proceeding was argued last week against this company to dissolve the corporation. The argument was that only one of the directors lived in Illinois, whereas the state laws required that there shall be a majority of them residents. It is also argued that the law requiring the company to have its general offices in the state has been disregarded. The company claims that by consolidation of the Illinois and Indiana branches it has ceased to be an Illinois corporation, and is not amenable to the state's jurisdiction. The case is now ready for trial, and the Court will be asked to declare the charter of the company forfeited, and to appoint a receiver.

Ohio River.—J. N. Trimble has just finished the location of this road to the coal fields of West Virginia.

Oregon, Southern Pacific Coast & Utah.—Incorporated in Oregon. The road will run from a point near Salt Lake City, Utah, northwest through Idaho to the headwaters of the North Umpqua River in Oregon; thence down that river to Roseburgh, and from there to Elkton in Douglas County, meeting the Umpqua Valley & Drain Railroad at or near Elkton. Principal office, Roseburgh, Oregon.

Pacific.—Charter filed in Kansas to build a road from Warwick, Republic County, to the north line of the state of Nebraska and to the Pacific Railroad in Nebraska.

Pennsylvania.—The company will replace the iron bridge on Eastern Division with stone structures. The contract for the bridge over Conestoga Creek is let to Keller & Goll, of Lancaster, Pa. The bridge will have 5 spans of 54 ft. each.

Peoria, Decatur & Evansville.—The company has decided to give up through east-bound traffic, on account of the Inter-state act, and will ask for differential rates for Peoria and Pekin, Ill., which are common points.

Philadelphia & Reading.—The holders of the first series 5s mortgage covering the connection of this road with New York, and who have refused to come into the reorganization plan, have asked for the return of their property. The company has refused to comply with this request.

There were $24,371,000 general mortgage bonds out of a total issue of $24,686,000 deposited under the reorganization plan when the time expired last week.

Richland.—Charter filed in Tennessee. The proposed road is from Nashville, along the line of the Hillsborough turnpike, to the town of Hillsborough, 70 miles.

Richmond & Allegheny.—The plan of reorganization of this company published in January has been modified. The new securities will be $6,000,000 first mortgage five per cent. bonds, $5,000,000 preferred stock and $5,000,000 common. In 1888 the interest on the bonds will be only two and one-half per cent. The present first mortgage bondholders will get 100 per cent. in new firsts, 37 per cent. in preferred stock and 30 per cent. in common stock. The seconds get 53¾ per cent. in preferred stock, and the common stock gets 70 per cent. in new common, having paid 10 per cent. assessment. Receiver's certificates will be paid from the assessment money, and those who paid the first assessment of $2.10 can give up their stock and get their money back. The new company will have $1,000,000 firsts and $1,000,000 preferred stock left in the treasury.

Rome & Carrollton.—The company will begin about May 1 on the construction of a standard gauge road, which is intended to extend for 140 miles from Chattanooga, Tenn., southward, through Walker, Chattanooga, Floyd, Polk, Haralson and Carroll counties.

St. Catharines & Niagara Central.—The contract for building this road from Thorold to Hamilton, Ont., has been awarded to Shields & Carroll, of Toronto.

St. Joseph & Grand Island.—Contracts have been let on this new road between Fairfield and Alma, Neb., 84 miles; also contracts for depots. New cars and locomotives have been ordered.

St. Paul, Minneapolis & Manitoba.—The company has issued instructions to begin tracklaying on the Rugby & Bottineau branch, Dakota. The work is to be completed before the next harvest.

San Pablo & Tulare Extension.—This company, which was incorporated in February, has its line completed from Tracy, in San Joaquin County, Cal., 17 miles southeast, and track is going down rapidly. Over 500 men are now cutting ties, telegraph poles and bridge timber for the company. The road as proposed will run to Pampa, in Kern County, 260 miles from Tracy.

Santa Rosa & Carquinez.—Articles of incorporation filed in San Francisco. The proposed road is from Santa Rosa to Benecia, Cal., about 50 miles. Capital stock, $2,500,000.

Santa Rosa, Sebastopol & Green Valley.—Articles of incorporation filed in California. The road is to run from Santa Rosa in Sonoma County westward to the town of Sebastopol, thence northwestward to a point about one mile north of Occidental on the San Francisco and Northern Pacific. Estimated length of road is 15 miles. Capital stock, $300,000.

Savannah, Dublin & Western Short Line.—This road is to be immediately built through to Macon, Ga., from Savannah, thence to Birmingham, and a branch to Hawkinsville. The plan is in charge of Douglass Green, President of the Macon & Covington road.

Southern Kansas.—The track is laid to the Canadian River in the Indian Territory, 156 miles south of Winfield, Kan. The river is now being bridged. It is expected that through trains will run from Winfield to Galveston, Tex., in another month, as only 30 miles of track are to be laid before meeting the other corps working from the south.

Southern Pacific.—The Hotel del Monte, at Monterey, Cal., was totally destroyed by fire on April 2. This hotel was the property of the above-named railroad company, and was one of the handsomest watering-place houses in America. It cost $350,000 and was not insured. It is to be rebuilt at once.

The company has secured control of the Portland & Willamette road, which runs between Portland and Dundee, Oregon, 28 miles. The acquisition gives the Southern Pacific a direct line into Portland by building 13 miles of track.

Tacoma Railway, Dock & Navigation Co.—Articles of incorporation filed in Washington Ter. The company intends to build a railroad from Tacoma to Vancouver, in Clark County, W. T., and from Tacoma to other points. It will also run steamboats on Puget Sound and its tributary waters. Principal office, Tacoma. Capital stock, $100,000.

Tivoli.—The road to be built from Baltimore to the proposed new steel works at Tivoli is now being surveyed. The new road will be 8 miles long, and will connect with the Baltimore & Ohio and the Philadelphia, Wilmington & Baltimore roads, but will be operated independently. A survey has been begun for a pier 1,000 ft. long on the river front at Tivoli. The steel works, when finished, will be the largest of their kind in the United States.

Toledo, Cincinnati & St. Louis.—Judges Gresham, Jackson and Welker met in Cleveland this week to adjust claims against this company amounting to $1,000,000. The road extends from Toledo to Cincinnati, O., and from Toledo through Indiana and Illinois to St. Louis. The road passed into the hands of a Receiver in 1883. The title of this case is the Central Trust Co., of New York, against the Toledo, Cincinnati & St. Louis Railway Co. The railroad is the consolidation of different companies and difficulties have arisen about apportioning the claims of the creditors of the various divisions. The trial will last a week. There is a dispute about the payment of from 3,000 to 4,000 claims.

Union Pacific.—The Attorney-General has decided that the Pacific Railway Commissioners may invest the sinking fund now on hand or hereafter accumulating on Pacific Railway first-mortgage bonds; but that they cannot sell the government bonds now on hand to purchase Pacific railway securities.

United States Railway Improvement Co.—This company has been chartered in Illinois. It will build the Central Missouri road from St. Louis to Kansas City, Mo.

Wabash, St. Louis & Pacific.—A judgment has been rendered against this company in favor of the Central Trust Co. in the sum of $20,654,523.

Wabash Western.—The Wabash, St. Louis & Pacific Railroad has passed into the possession of the Purchasing Committee. No changes are made in the officers of the company. The committee has authorized General Manager Talmage to assume control of the Des Moines & St. Louis, Des Moines & Northwestern, Attica, Covington & Southern and Champaign & Southwestern roads. O. D. Ashley and A. A. Talmage, as managing agents, have assumed control of the Detroit, Butler & St. Louis and the Eel River roads, and have appointed the same officers as those over the Wabash Western.

Warrior Coal Fields.—The road is to be built from Meridian, Miss., to Decatur, Ala., $100,000 having been subscribed.

Wilkesbarre & Western.—This new road from Watsontown, Pa., to Shickshinny was opened to Millville, Pa., on April 8. The road is to be extended to the Clearfield coal region.

TRAFFIC AND EARNINGS.

Cotton.

The cotton movement for the week ending April 1 is reported as below, in bales:

Interior markets:	1887.	1886.	Inc. or Dec.	P. c.
Receipts	29,299	25,130	I. 4,169	16.5
Shipments	60,427	47,859	I. 13,568	28.3
Stock	143,168	335,663	D. 192,495	57.3
Seaports:				
Receipts	34,115	59,095	D. 24,980	42.2
Exports	77,319	77,389	D. 170	0.2
Stock	541,192	851,740	D. 310,548	36.4

The total movement from plantations for the crop year ending April 1 was 6,009,224 bales, against 5,992,544 last year, 5,388,852 in 1884–85, and 5,346,969 in 1883–84.

The coal tonnage of the Pennsylvania road for the week ending March 26 was as follows:

	Coal.	Coke.	Total.	1886.
Line of road	179,437	83,451	262,888	165,533
From other lines	95,356	3,514	98,870	84,443
Total	274,793	86 965	361 758	249,976
Year to March 26	3,057,446	1.047 979	4,105,425	3,365,548

Increase for the week, 111,782 tons, or 44.7 per cent.; increase for the year, 739,877 tons, or 21.9 per cent.

Coal.

Coal tonnages for the week ending April 2 are reported as follows:

	1887.	1886.	Inc. or Dec.	P.c.
Anthracite	646,855	610,140	I. 36,715	6.0
Bituminous	303,781	121.348	I. 82,433	67 9
Coke (March 26)	86,965	69,994	I. 16,971	24.2

Cumberland coal shipments for the week ending April 2 were 66,809 tons, and for the year to that date, 752,159 tons, an increase of 380,849 tons, as compared with the corresponding period last year.

New Rates.

The Pennsylvania gave notice this week that a change had been made in the rates to places on the line of the New York, Philadelphia & Norfolk road. The rates to Norfolk, Va., have always been made to meet water competition, but intermediate points have had to pay a great deal more By the new rule none of these places will have to pay higher rates than those charged to Norfolk: First class, 35 cents; second, 30 cents; third, 25 cents; fourth, 20 cents; fifth, 16 cents; sixth, 13 cents. It is also understood that the Pennsylvania will apply the trunk line classification to its l cal business, substituting it for the several local classifications now in use on its lines.

The Lehigh Valley has not yet issued its passenger tariffs in full, but one of its pamphlets giving fares from Philadelphia decreases the Chicago limited ticket rate from $18.50 to $18.25 and another increases the unlimited fare from $23.25 to $24.

On the Missouri Pacific rates from St. Louis to Missouri River points are: First-class, 70 cents; second, 55 cents; third, 40 cents; fourth, 30 cents; fifth, 25 cents. Rates to Arkansas points have undergone considerable change. The principle acted upon has been to protect local rates. Texas rates to Galveston and Houston have been advanced. The San Francisco schedule is not yet issued. The Wabash Western, it is said, will make rates to Missouri River points to harmonize with the Missouri Pacific.

Association of Coal Operators.

The railroad coal operators of the Pittsburgh districts who ship to Western points, have formed an association for the maintenance of a uniform selling price of coal. Eighty per cent of the firms shipping West, and representing $12,000,000 capital, have joined the pool. An effort will be made to have the Hocking Valley syndicate operate with the new association.

A Dispute Settled.

The Chicago and Grand Trunk has been temporarily satisfied in its demand for differentials of freight from the West to New England by the way of Montreal. It is said that the Trunk Line's committee has promised that if the company cannot compete at even rates, a differential will then be granted.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	1887.	1886.	Inc. or Dec.	P. c
Month of March:				
Atlantic & Pac.	$229,728	$127,427	I. $102,301	80.2
Buff., N. Y. & P.	206,000	204,800	I. 1,200	0.5
Buff., R. & Pitts.	155,766	120,398	I. 35,368	29.3
Chic. & Atlantic	213,760	130,084	I. 83,676	64.3
Chi., Mil. & St. P.	2,212 000	2,031,613	I. 180,387	8.7
Chi. & East. Ill.	168,113	143,059	I. 25,054	17.6
Canadian Pac.	656 000	635,000	I. 21,000	3.3
Cin., H. & Day.	289,921	282,154	I. 7,767	2.7
Cairo, V. & C.	63,513	48,452	I. 15,061	31.0
C., I., St. L. & C.	231,879	228,709	I. 3,170	1.3
Denver & R. G.	586,400	479,183	I. 107,217	22.3
Det., Lan. & No.	96,093	97,381	D. 1,288	1.3
Ev. & Terre H.	70,688	58,133	I. 12,555	21.7
Ev. & Ind'apolis.	22,444	12,402	I. 10,042	80.9
Ft. Worth & D. C.	55,849	22,934	I. 32,915	143.7
Ind., Bloom. & W.	243,510	203,876	I. 39,634	18 9
Long Island	196,903	195,823	I. 3,080	1.5
Louis., N. A. & C.	191,301	134,949	I. 56,361	41.7
Lou., N. O. & T.	152,878	128,040	I. 24 838	20.4
Mil., L. S. & N.	234,226	146,820	I. 87,406	59 4
Michigan Central	126,175	102,664	I. 23,511	22.9
Northern Pacific	948,198	858,116	I. 90,082	10.4
Ohio & Miss.	378,533	305,706	I. 72,827	23.8
Ohio Southern	51,455	38,945	I. 12,510	32.1
Pac. Coast Co.	190,000	157,053	I. 32,947	20.9
Peoria, Dec. & E.	73,608	52,500	I. 21,108	40.2
St. L., A. & Tex.	181,613	143,486	I. 38,127	26.5
St. L. & San F.	547,700	385,700	I. 162,000	42.0
T., A. A. & N. M.	46,637	28,787	I. *17,850	61 9
Tol. & Ohio Cen.	76,334	53,180	I. 23,154	43.5
Wabash, East of Miss.	608,976	498,591	I. 110.585	24 9
Total	$9,516,001	$8,034,056	I. $1,481,945	18.4
Month of February:				
Cleve. & Canton.	$22,551	$21,630	I. 921	4.3
Net earnings	2,169	2,465	D. 296	11.8
Grand Rap. & I.	150,457	136,838	I. 13,619	9.9
Net earnings	42,187	45,443	D. 3,256	7.1
Gr. B. & W.	30,223	21,378	I. 8,845	41.3
Louisv. & Nashv.	1,170,453	1,049,266	I. 121,187	11.5
Net earnings	423,613	383,814	I. 39,799	10.3
L., N. O. & Tex.	178,929	139,210	I. 39,719	*8.5
Net earnings	53,263	34,643	I. 18,620	53.8
Mem. & Charles.	125,375	106,231	I. 19,144	18.0
Net earnings	54,810	20,185	I. 34,626	171.4
Norfolk & West.	299,303	221,788	I. 77,515	34.9
Net earnings	126,628	84,331	I. 42,297	50.1
Northern Pacific	525.728	594,240	D. 68,512	11.5
Net earnings	26,602	182,708	D. 156,106	85.7
Union Pacific	1,675,914	1,594,776	I. 81,138	5.0
Net earnings	445,244	516,360	D. 71,116	13.7
Total (gross)	$4,178,933	$3,885,357	I. $293,576	7.5
Total (net)	1,174,516	1,269,949	D. 95,433	7.5
Month of January:				
Atch., T. & S. F.	$1,312,591	$862,203	I. $450,388	52.3
Net earnings	581,085	296,271	I. 284,814	96.0
Louisv. & Nash.	1,228,093	1,050 686	I. 177,407	16.8
Net earnings	440,942	372,508	I. 68,434	18.3
Northern Pac.	591,421	480,330	I. 111,091	23.1
Net earnings	40,721	30,052	I. 10,669	35.4
Total (gross)	$3,132,105	$2,393,219	I. $738,886	31.7
Total (net)	1,062,748	698,831	I. 363,917	52.0
Two months to Feb. 28:				
Canadian Pac.	$1,154,138	$985,816	I. $168,322	17.0
Net earnings	*47,936	116,098	D. 68,162	59.7
C., St. L. & P.	852,197	690,837	I. 161,360	23.3
Net earnings	203,026	110,729	I. 92,297	83.3
Grand Rap. & I.	291,692	253,572	I. 38,120	15 0
Net earnings	80,562	77,002	I. 3,560	4.6
Louis. & Nash.	2,398,546	2,099 952	I. 298,594	14.2
Net earnings	864,555	756 322	I. 108,233	14.9
L., N. O. & Tex.	396.992	298,958	I. 98,034	32.7
Net earnings	137,630	70.919	I. 66,711	94.0
Norfolk & West.	578,609	440,695	I. 137,914	31.2
Net earnings	228,814	161,999	I. 66,815	41.2
Northern Pac.	1,097,149	1,074,570	I. 22,579	2.1
Net earnings	667,323	212,700	I. 454,563	213.6
Union Pacific.	3,413.067	2,984,386	I. 428,681	14.4
Net earnings	875,311	747,674	I. 127,637	17.0
Total (gross)	$10,182,390	$8,828,786	I. $1,353,604	15.3
Total (net)	3,105,157	2,253,503	I. 851,654	37.7
Three months to Feb. 28:	1886-87.	1885-86.		
Mil. & Northern	$213,232	$143,257	I. $69.975	48.8
†Phil. & Reading	8,164,086	7,194,736	I. 969,350	13.4
Net earnings	2,127,485	1,260,100	I. 867,3-5	68.8
‡Tol., A. A. & N. M.	115,274	76,526	I. 38,748	50.6
Five months to Feb. 28:				
Buff., N. Y. & P.	$1,004,818	$997,544	I. $7,274	0.7
Net earnings	9,510	228,211	D. 218,701	95 8
N. Y., Ont. & W.	563,679	699,330	D. 135,651	21.2
Net earnings	39,141	55,550	D. 16,409	29 5
Six months to December 31:				
Louis. & Nash.	$7,663,147	$6,841,926	I. $821,221	12.0
Net earnings	3,229,502	2,690,243	I. 539,259	20.0
Northern Pac.	7,342,295	6,743,260	I. 599,035	8.8
Net earnings	3,970,124	3,640,981	I. 329,143	9.0
Eight months to Feb. 28:				
Cleve. & Canton	$246 026	$190,9-0	I. $55,117	28.8
Net earnings	49,472	29,769	I. 19,703	66 1
Louis & Nash.	10,061,693	8,041,878	I. 1,019.815	11.4
Net earnings	4,094,057	3,446,565	I. 647,492	18.7
Mem. & Charles.	1,131,252	949,922	I. 181.330	19.0
Net earnings	391,832	302.094	I. 89.738	29.7
Northern Pacific.	8,439,444	7,819,839	I. 619 605	7.9
Net earnings	4,037,447	3,853,741	I. 183,706	4.8
Total (gross)	$19.878.415	$17,900,584	I. $1,977,867	11 0
Total (net)	8,572,808	7,632,169	I. 940,639	12.3
Year to Dec. 31:	1886.	1885.		
Chic., Burl. & Q.	26,728.408	26,556 425	I. 171.983	0.6
Net earnings	12,236.7.5	12,150,658	I. 86,067	0 7
Cinn. & M. Valley	391,132	319,645	I. 71,487	22.3
Net earnings	74,511	*66,917	I. 7 594	11 3
Mor. La. & Texas.	4,185,438	4,232,018	D. 46 580	1.1
Net earnings	1.043,139	1.602 567	D. 559,438	34.9
Panama Ry. Co.	3,051,559	3,267,922	D. 216,363	6.6
Net earnings	118,581	71,609	I. 46,972	65.6
St. Louis & S. F.	4,874.628	4,383,406	I. 491,222	11.2
Net earnings	2,652,332	2,433,661	I. 218,671	8.9
Total (gross)	$39,231,165	$38,750,416	I. $417,749	1.0
Total (net)	16,125,278	16.325,412	D. 200,134	1.2

* Deficit. † Includes Coal & Iron Co. ‡ March 31.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

Fast Time on the Vandalia.

The fast mail on the Panhandle was recently delayed over five hours, and when the train reached Columbus, Ohio, special preparations were made for a quick run to St. Louis in order to recover the lost time. The run from Indianapolis to East St. Louis, 237 miles, was made in exactly 5 hours, giving an average speed, including stops, of 47.4 miles per hour

Nineteen stops were made in all, and engines were changed at Terre Haute.

State and Inter-state Matters.

The Minnesota State Railroad Commission, in a letter to E. W. Winter, of the Chicago, St. Paul, Minneapolis & Omaha road, in answer to an inquiry made whether the new railroad law permitted the issuance of half-fare tickets to clergymen, cite the provisions of the law which bear upon the case, and say: "We are compelled to hold that it was not intended to allow such reduced rates to ministers of religion in this state."

The Pittsburgh & Lake Erie, the Pittsburgh & Western, and the Allegheny Valley roads say that they are in a fix and throw the blame all on the Inter-state Commerce bill. It is claimed that instead of there being four competing lines to the East there are now none. They say that the Pennsylvania road has everything in its own hands; and as an evidence the rate on iron in less than car loads has already been advanced 2 cents per 100 lbs. This advance can be continued if the management of the Pennsylvania so desires, and the other roads are powerless. Through billing has also been done away with. Before this if a shipper wanted a bill made through he could receive it at the Pittsburgh office of the shipping road; now he can only receive the bill to the end of the road receiving the freight. Heretofore if a person wished to ship freight to Saginaw, Mich., or Bay City, the Chicago rate was given and the difference divided pro rata between the various roads. This cannot be done now, for if there should be a slight difference in favor of any one town the road sending the freight is held responsible. For these reasons no through bills of lading are being issued.

Ex-Governor Bullock, as Chairman of the Atlanta Chamber of Commerce Committee, appeared before the Inter-state Commerce Commission in Washington last week and read a paper, setting forth that the territory covered by the Southern Railway & Steamship Association is sparsely populated and the trade centres widely separated, so that a rule which would apply to lines running through a thickly-populated country would be disastrous to it. The territory of the Association is south of the Potomac and Ohio rivers, and east of the Mississippi, and the rates now in force represent the result of ten years of experiment, modified and to some extent regulated by the authority and acts of the state railroad commissions. The rates now in force are acceptable to the shippers generally, and under them trade has been established, large interests developed and the sale of commodities generally regulated. A sudden change would seriously injure many interests and would actually paralyze others. The document sets forth that the railway managers fear that under the operations of the Inter-state act they may be forced to largely increase their through rates on April 5. That would destroy the entire system of rates on which the Southern manufacturing industries have been founded and are now successfully operating. Wholesale dealers have established their prices upon the basis of these rates and a sudden increase would upset and demoralize all branches of trade. Therefore the Committee appeals to the Commission to issue an order on or before April 5, to the effect that the schedule of rates existing in the territory south of the Potomac and Ohio, and east of the Mississippi rivers so far as these rates relate to inter-state commerce be declared in force and to continue until the further order of the Board; and that a reasonable time be given for further hearing and revision before any changes shall be put in force.

Milton H. Smith, Vice-President of the Louisville & Nashville, appeared before the Commission as spokesman for the Southern Railway & Steamship Association, and said that his company had received notices from all the great lines of the North that from and after April 5 all existing traffic arrangements must cease. This was due, he explained, to a difference in the interpretation of the law. These roads based their action upon the refusal of the Louisville & Nashville to reduce its local rates below its through rates, holding that they would be liable as participants in any penalties incurred by the former. Mr. Smith set forth at considerable length the circumstances which led the Northern trunk lines to make such a construction of the law. They were not subject to such an extent to water competition, and their interpretation was the only one that was advantageous to them. They would appear before the Commission and advocate an interpretation which would "benefit them, but bankrupt us."

General Alexander, President of the Central of Georgia set forth the reasons which led his line to give lower rates from New York to Macon and Montgomery than to Mobile and New Orleans. The latter points were reached by competitors who were entirely independent of the Commission. If compelled to reduce intermediate rates below the all water rates to New Orleans, his company would lose ten dollars in local traffic for every three dollars gained in through traffic.

Edgar M. Johnson, General Counsel for the East Tennessee, Virginia & Georgia Railroad, said it was evident that unless relief were granted all commerce between the North and South must end on April 5, since the Northern roads would not risk the penalties which might be incurred by following any other than their own interpretation of the law.

Henry Fink, Vice-President of the East Tennessee, Virginia & Georgia road, said the rigid construction of the long and short haul provision meant bankruptcy. What kind of schedules were the roads to file between now and the 5th of April? If they put up the through rates to a level with local rates they would lose their traffic, and that meant bankruptcy. If they put down local rates they could never get them back, and that, too, meant bankruptcy.

Chairman Cooley has written the following letter:

To G. C. Cheney, Esq., General Superintendent Canadian Express Co., Montreal:

DEAR SIR: Your letter of the 1st inst., requesting the decision of the Commission upon the question whether the Inter-state Commerce law applies to express companies, has been laid before the Commission and duly considered. If any express company desires to be heard by the Commission on the question you raise, an early opportunity will be offered for the purpose; but until such hearing is applied for the Commission will assume that the law does apply to such companies.

Very respectfully yours,
T. M. COOLEY,
Chairman.

Petitions have been pouring in from all sides during the week for relief from the long and short haul clause in the new law.

The Inter-state Commerce Commission went into secret session to deliberate upon the petition submitted by the various railroad companies in the Southern Railway & Steamship Association, and on April 6 gave out its ruling in the matter. In view of the reasons set forth why the fourth section of the long and short haul clause would be disastrous to the business of these Southern roads, if enforced, the Commission orders that the existing rates may be maintained until a complete investigation of the merits in the case can be instituted, and to this end the Commission will convene at Atlanta, Ga., on April 26; at Mobile, Ala., on April 29; at New Orleans, La., on May 2, and at Memphis, Tenn., on May 4.

Mayor Hewitt on the Broadway Elevated.

The following letter was read at a meeting of the New York Senate Railroad Committee this week:

"I have no wish to oppose the desire of property owners properly expressed to have an elevated railroad in Broadway, but in behalf of the city I insist that provision should be made so that adequate compensation may be paid for the franchise. In the case of the Illinois Central Railroad Company the state reserved 7 per cent. of the gross proceeds of a railway authorized to be constructed through an absolute wilderness. In the case of Broadway the traffic is practically unlimited, and such a grant must necessarily be of enormous value. I think the amount to be paid to the City Treasury should be not less than that paid to Illinois by the Illinois Central Railroad, but if I had my way in the matter I would reserve a payment of 10 per cent. of the gross proceeds. Under no circumstances ought the percentage to be imposed on the net proceeds, for reasons which will be obvious to you as an experienced railroad man. I rely upon you to protect the interests of the city in the matter, and I am quite sure you will agree with me that with the reservation of 10 per cent. of the gross proceeds capital will be readily supplied to build the road. Indeed, if it were not for my official position I would be glad to undertake it myself, and pay an even larger sum to the City Treasury."

An End to Commissions.

The General Passenger Agents of the trunk lines met at Commissioner Fink's office in New York this week, and formally decided to have nothing more to do with roads that will not agree to stop paying commissions for the sale of tickets. Most all the companies have agreed. The only trouble is with the amalgamated Western roads. The Canadian Pacific has also failed to give notice of its intentions, and tickets over its road have been taken off of the trunk lines.

One Effect of the New Law.

It is said that the Inter-state law will have a great effect on St. John, N. B., trade, changing the channel to the United States from the New Brunswick to the International line of steamers. The road was forced to raise its rates, and thus St. John is deprived of daily freight transit, and will now depend on tri-weekly steamers.

East-bound Shipments.

The shipments of east-bound freight from Chicago for the week ending April 2 amounted to 81,220 tons, against 74,486 tons during the preceding week, an increase of 6,734 tons. The percentage carried by each road was as follows: Wabash, St. Louis & Pacific, 10.7; Cincinnati, Indianapolis, St. Louis & Chicago, 4.8; Michigan Central, 3.0; Lake Shore & Michigan Southern, 9.4; Pittsburgh, Fort Wayne & Chicago, 15.9; Chicago, St. Louis & Pittsburgh, 14.4; Baltimore & Ohio, 7.0; Chicago & Grand Trunk, 9.4; New York, Chicago & St. Louis, 10.8; Chicago & Atlantic, 14.6.

The Indian River Canal.

Strong efforts are making to raise about $500,000 to complete the canal connecting the Indian River, Florida, with the St. John's. About half the excavation is done.

Coal Freight Rates.

The Pennsylvania Railroad Co. has made a rate on Shamokin and Wilkesbarre coal to Philadelphia at $1.95 per ton from the mines. The through rate to Baltimore and Washington will be the same, and to New York the through rate is only $1.75 per ton. The rate on pea coal is to be 15 cents less in each instance.

The Baltimore & Ohio's Circular.

President Robert Garrett has issued the following circular:

In order to comply with the provisions of the Inter-state Commerce act, the following rules with regard to inter-state passes will govern on and after April 1:

1. No inter-state passes will be issued, except:

(a) To officers and employés of other railroad companies. All such passes must show the name and character of employment of the officer or employé, and will be issued only on the written request of a President, Vice-President, General Manager, or other executive officer.

(b) To employés of this company, and the members of their immediate families, under existing rules.

2. Where passes are issued good only in one state, no pass must be given to the same person for travel in another state.

3. No passes must be issued reading "and one" (or more), but the full name of each person must appear.

4. No passes, either state or inter-state, will be issued on account of traffic.

The half passenger fares and reduced freight rates heretofore extended to employés, the special arrangements for reduced fares and freight rates and other concessions under Circular No. 7, and the reduced rates to clergymen, will be continued as heretofore, under existing rules.

Pennsylvania Coal Rates

The Pennsylvania and the Philadelphia & Reading have agreed to maintain the present rates on coal at all hazards, and it is expected that henceforth the two roads will work in harmony.

The Union Bridge Co.

It is officially announced that the co-partnership under the above name was terminated March 1, by limitation, and a new firm was formed under the same title. Messrs. C. S. Maurice, Charles Macdonald, Geo. S. Field and Edmund Hayes constitute the new firm, Messrs. T. C. Clarke and Charles Kellogg having withdrawn. Mr. Clarke will remain with the company until the Poughkeepsie and Hawksbury bridges are finished. Mr. Kellogg goes out on account of broken health.

Inter-state Bureau of Statistics.

The Southwestern Railway Association will hereafter be called the Inter-state Bureau of Statistics. A meeting was held in Chicago this week. The General Managers will hold a meeting on April 27.

A Circular from the Pennsylvania.

The Pennsylvania Company has issued the following circular:

(Circular No. 675.)

Pennsylvania lines west of Pittsburgh operated by the Chicago, St. Louis & Pittsburgh Railroad Co., and Pennsylvania Co., and the Pittsburgh, Cincinnati & St. Louis Railroad Co.

To the Ticket Agents of the above-named Companies:

Tickets described below are hereby ordered off sale, taking effect at midnight of April 4, 1887, and after that hour you will not sell a through ticket, any portion or coupon of which reads over any part or division of either of the following-named railroads or railways or lines until further notice:

Boston & Albany, Burlington, Cedar Rapids & Northern, Canada Pacific, Central Georgia, Central Iowa, Central Vermont, Chicago & Alton, Chicago & Northwestern, Chicago, Burlington & Quincy, Chicago, Rock Island & Pacific, Chicago, St. Paul, Minneapolis & Omaha, Delaware & Hudson Canal Company, Denver & Rio Grande, Denver, Rio Grande & Western, Des Moines & Fort Dodge, Detroit & Cleveland Steam Navigation Company, Hannibal & St. Joseph, Illinois Central, Indiana, Bloomington & Western, Kansas City, St. Joe & Council Bluffs, Minneapolis & St. Louis, Missouri, Kansas & Texas, Missouri Pacific, Rock Island & Peoria, Iron Mountain, Manitoba, Southern Kansas, Wabash (west of the river), Wisconsin Central.

The sale of through tickets over railroads or railways, or lines not specified above, may be continued as usual at the tariff rates indicated in the circular No. 672, dated March 30, 1887. The agent will please acknowledge receipt of this notice by first train on inclosed card.

E. A. FORD, General Passenger Agent.
F. VAN DUZEN, Assistant General Passenger Agent.

Assistant General Passenger Agent Van Duzen has said that this order is only a temporary one, and as soon as the Pennsylvania Company is legally given authority to act as agents for the connecting roads, the tickets will be reinstated.

The Effect of the Law.

The operation of the Inter-state law caused very little trouble in New York when it went into effect this week. All the companies posted their schedules of rates, as required, and business was conducted as usual. The Baltimore & Ohio's passenger rates are based on $15 from New York to Chicago. The New York, Lake Erie & Western, the Delaware, Lackawanna & Western and the West Shore charge $18.50, and the New York Central & Hudson River and Pennsylvania $20. These differentials are recognized by all the roads.

Demurrage on Detained Cars.

At a meeting of the Superintendents of the Trunk lines in New York this week the question was discussed as to what the best methods will be for recovering demurrage for cars detained by lines which do not own them. No definite action was taken in the matter.

California Rates.

Southern Pacific circulars announce the advance of general first-class matter from New York to San Francisco from $2 to $5.20, and on cotton from 90 cents to $5.20. The old prices, it will be remembered, were, and had for a long time been, "cut" just half from tariff rates.

ANNUAL REPORTS.

Union Pacific.

The Union Pacific system is composed of the roads of the Union Pacific Railway Co., 1,832 miles, and auxiliary lines, 2,762 miles. The system has a total length of 4,594 miles. The earning of the Union Pacific proper, 1,832 miles, for the year 1886, compared with the previous year, were:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$17,906,132	$17,455,031	I. $351,101	2.0
Expenses	9,685,771	8,560,621	I. 1,125,150	131
	$8,120,361	$8,894,410	D. $774,049	8.7
Taxes	597,654	489,734	I. 107,920	22 0
Net earnings	7,522,707	8,404,676	D. 881 969	10.4
Gross earn. per mile.	9,717	9,525	I. 192	2.0
Net " "	4,105	4,586	D. 481	10.4
P.c. of exps	54.4	49.0	I. 5.4	....

The earnings of the auxiliary lines, 2,761 miles at the close of 1886, against 2,687 in 1885, were:

	1886.	1885.	Inc. or Dec.	P. c.
Earnings	$8,797,664	$8,219,643	I. $578,021	7.0
Expenses	6,867,338	6,522,554	I. 344,784	5.2
	$1,930,326	$1,697,089	I. $233,237	13.7
Taxes	457,855	414,325	I. 43,530	10.5
Net earnings	$1,472.471	$1,282,764	I. $189,707	14.7
Gross earn. p mile.	3,239	3,111	I. 128	4.1
Net " "	542	485	I. 57	11 4
Per cent. of exps.	78.0	79.3	D. 1.3	.. .

The earnings of the Union Pacific System, 4,594 miles at the end of 1886, against 4,519 in 1885, were:

	1886.	1885.	Inc. or Dec.	P.c.
Earnings	$26,603,797	$25,674,674	I. $929,123	3.6
Expenses	16,553,109	15,083,175	I. 1,469,934	9.7
	$10,050,688	$10,591,499	D. $540 811	5.1
Taxes	1,055,510	904,058	I. 151,452	16.7
Net earnings	$8,995.178	$9,687,441	D. $692,263	7.1
Gross earn. per mile.	5,849	5,738	I. 111	1.9
Net " "	1,977	2,165	D. 188	8.5
Per cent. of expenses.	62.2	58.7	I. 3.5	....

The funded and floating debt of the entire system was as follows at the close of the last two years:

	1886.	1885.
Funded debt in hands of public	$148,233,092	$144,788,958
Funded debt held by Co	637,300	2.147,450
Total funded debt	$148,870,392	$146,936,408
Net floating debt	*1,351,189	1.861,445
Total debt	$147,519,203	$148 797,853
Total debt per mile of road	32,108	32,923

* Excess cash and cash resources.

The increase in funded debt during 1886 was $1,933,984. The decrease in net floating debt was $3,212,634. Total decrease in debt, $1,278,650.

The full balance sheet on Dec. 31, 1886, was as follows:

Liabilities.

Capital stock		$60,868,500
Funded debt	$88,768,277	
Less amounts held in K. P. Con. Mortgage Trust	6,799,150	
		81,969,127
U. S. 6 per cent. currency bonds		33,539,512
Interest on U. S. bonds	$38,130,481	
Less amounts repaid by Co	22,459,727	
		15,670,753
Interest not yet due		758,493
General income	$16,915,421	
Income used for sinking funds	3,568,599	
Land and trust income	19,828,518	
Total income accounts	$40,312,538	
Less deficit U. S. requirements	3,087,965	
		37,224,574
Total liabilities		$230,030,959

Assets.

Cost of road and equipment		$161,283,688
Other investments:		
Securities, railroad	$32,911,776	
" coal, steamship, etc.	2.617,411	
" in K. P. Con. mortgage trust.	3,217,250	
Miscellaneous	755.749	
Advances to auxiliary companies	5,697,670	
		45,199,858
Cash and cash resources, balance of		1,351,189
Sinking fund, Denver Extension, held		618,639
Collateral trust sinking funds		68.848
Fuel, material and stores		2.889,218
Land contracts, land cash, etc		18,599,519
Total assets		$230,030,959